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Agriculture

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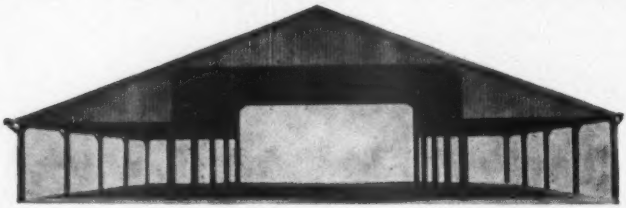

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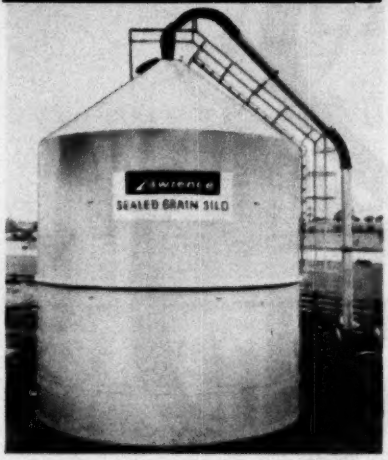

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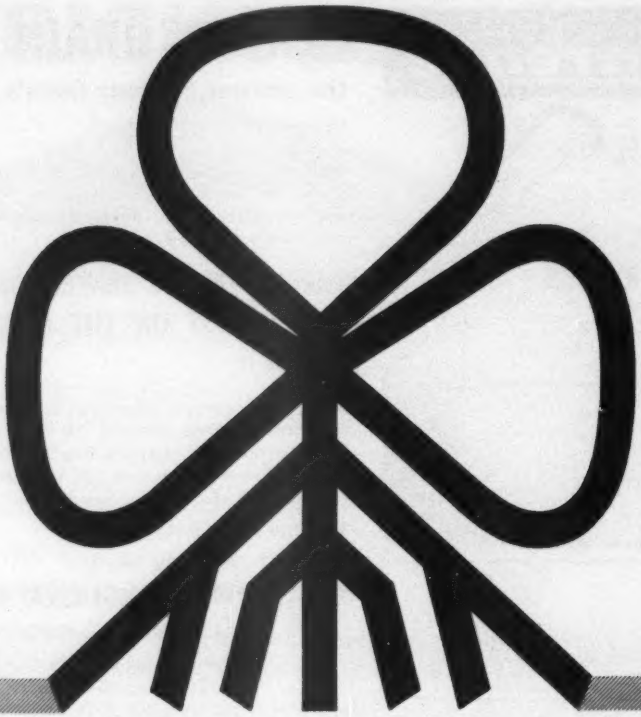

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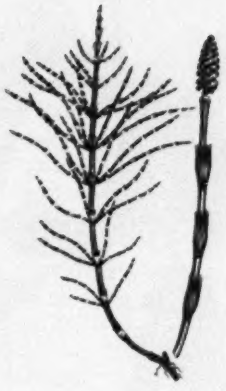
MODERN FARMERS RELY ON ICI—AND PROFIT BY EXPERIENCE

AGRICULTURE JUNE 1964

Watch your hay for HORSETAILS



HORSETAILS, mare's tails, cat's tails, toad-pipes, paddock-pipes, call them what you will, are still to be found all too often on both grazing and arable land, especially in damp areas. There are no less than ten species in this country, and two of them, the Common Horsetail and the Marsh Horsetail, are little short of ubiquitous. Years ago we used to use them as pot-scourers: the mature plants contain a lot of silica. Like ragwort, grazing animals ignore this weed; it is when they are fed in hay that trouble is likely to start.

The alkaloid poison, palustrine, which horsetails contain, is unimpaired by the temperatures reached in haymaking and storage, and there is also an enzyme (thiaminase) present which has the effect of destroying vitamin B_1; the same enzyme is contained in bracken.

Sheep, horses, cows and steers are all susceptible. The symptoms are an unsteady gait, an unthrifty appearance and slow pulse. Affected dairy cows will show a sharp and spectacular drop in milk yield and general loss of condition; diarrhoea is common, but not invariably present. Treatment consists of an immediate change of food and the administration of vitamin B_1, but it must be started early.

Drainage of the soils where horsetails are growing is the first step towards eliminating these weeds, followed by liming. There are no chemical weed-killers that can be relied upon to eradicate horsetails, although repeated use of a herbicide may gradually suppress them, especially where competition from the grass components of the sward is increased by suitable management. The shoots of horsetails are, however, sensitive to growth-regulator herbicides, such as MCPA and MCPB, and an application of one of these herbicides a fortnight before the grass is to be cut will kill the shoots and permit a safe crop of hay or silage to be taken.

Some 50,000 to 60,000 tons of peas go for quick freezing every year, and production is still on the increase

DARK SKIN PERFECTION
the most widely grown variety for quick freezing

V. D. Arthey

Quick Frozen Peas

Some factors affecting their quality

ABOUT 70 per cent of the pea crop grown each year in Great Britain now goes to the processors; ten years ago the proportion was 40 per cent. Both canning and freezing have contributed to this sharp increase in demand, but whereas the production of canned garden peas now tends to be static, that of quick frozen peas is still on the increase. All told, between 100,000 and 120,000 tons of vined peas for canning and freezing are produced every year, and this quantity is about equally divided between canners and freezers.

It is well known that wrinkled-seeded varieties of peas are sweeter than smooth-seeded types, and for this reason the former are used almost exclusively for quick freezing in Britain. At the stage of maturity at which peas are generally frozen (equivalent to a tenderometer reading of 100), smooth-seeded varieties contain about twice as much starch as sugar, but in wrinkled-seeded peas the sugar content is about four times that of the starch content.

Right varieties

The variety suited to quick freezing must be acceptable to the grower and processor alike from sowing to maturity. The grower wants a variety which will yield heavily, be resistant to disease (e.g., downy mildew and *Fusarium*), and not be liable to damage by weed-killers. Whether vining is carried out by the processor or by the grower, the variety should not be long in the straw. The pods should be well but not tightly filled and should have blunt ends. Peas which do not mature quickly are preferred, because of the longer period over which they can be harvested for processing.

From the processor's point of view the crop should be as even in maturity as possible—i.e., ideally, at the same stage of maturity, they should have a bright but deep green colour and contain no cream coloured or yellow peas. Unlike canning peas, to which artificial colour is added, no colouring matter is used with quick frozen peas, and the product therefore relies for attractiveness on the natural pea colour. There is a trend by some quick freezers to prefer peas of a small sieve size, and this may lead to slight changes in some of the varieties grown for this purpose in the next few years.

The selection of varieties for quick freezing is not based entirely on their merits of habit and quality but also on their season of maturity. Because of the high activity which takes place during the short season, varieties must be selected which will mature in a succession, so enabling the factory to be at full production—generally including night-shifts—during a six-week period in summer. The machinery required to process quick frozen peas satisfactorily is costly, and it is uneconomic to allow it to stand idle waiting for a crop to reach maturity.

At present the most widely grown varieties for freezing are Dark Skin Perfection, Perfected Freezer, Kelvedon Wonder, and to a less extent Olympic, Fraser, Victory Freezer, Thomas Laxton and Lincoln.

Search for new peas

None of these, however, has all the desirable characteristics mentioned above, and the search for newer and better varieties is constantly going on. Each year the Pea Growing Research Organisation at Yaxley draws new and promising varieties from many countries of the world in an effort to replace existing types. The peas from these screening trials are processed and examined at The Fruit and Vegetable Canning and Quick Freezing Research Association at Campden. In main trials conducted jointly at Yaxley and Campden, promising new varieties selected from the screening trials of the previous year are grown to maturity. The varieties found suitable for quick freezing are then processed at Campden and later examined by the Quality Inspection Panel. The results are published each winter in a technical memorandum which is available to members of both Associations.

Many new varieties have given promising results when examined closely in the main trials, but few have been consistently better than the controls and none has excelled in all the qualities required of a pea for quick freezing.

The National Institute of Agricultural Botany at Cambridge has also conducted similar trials with new varieties of peas, and this year the three centres hope to combine their efforts to avoid duplication of trials. The outcome should be a concerted effort to replace existing varieties with new ones more suited to the requirements of the canning and freezing industries.

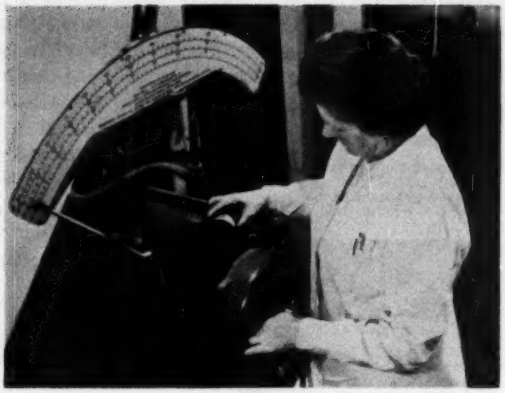
Testing for point of maturity

The final quality of a pack of quick frozen peas also depends to a large extent on the ability of the fieldsman to have the crop harvested at the correct stage of maturity. The quality of maturing peas improves slowly. The point of perfection having been reached, it declines fairly quickly. Before maturity the peas may be flavourless, small and with little development of the cotyledons. Beyond maturity the skins quickly toughen and the flesh becomes mealy.

The right stage of maturity of peas for quick freezing is measured by tenderometers in this country. These are electrically operated instruments which measure the force required to press a sample of peas through a standard grid. Though not ideal, this method has practical advantages for growers and processors. An alternative, chemical method, based on the determination of the alcohol insoluble solids content of the peas, has certain merits, but it is a rather lengthy operation (requiring at least half an hour, and more often about three hours to complete) under the skilled attention of a laboratory assistant; and the results cannot readily be checked by the grower. Peas for quick freezing should give a tenderometer reading of 95–105, which is equivalent to an alcohol insoluble solids content of about 11–12 per cent. It is common practice to use the tenderometer to fix the price paid by the processor. The scale of prices may be adjusted so that the monetary return per acre to the grower is not materially affected by the maturity at which the peas are harvested within the acceptable range.

The texturemeter is sometimes used to measure pea maturity where a light mobile instrument is required. A small circular container is carefully filled with peas and placed under the instrument. Twenty-five pins pierce the sample and the resistance offered is recorded on a dial. Because of the smaller sample size, about four readings to every one of the tenderometer have to be made to obtain a representative figure.

Where a light, mobile instrument is required, the texturemeter is used to measure pea maturity. Twenty-five pins pierce a sample of peas in a small, circular container and the dial records the resistance offered



This electrically-operated machine, the tenderometer, is commonly used to fix the price paid by the processor for peas. It determines the right stage of maturity of peas for quick freezing by measuring the force required to press a sample through a standard grid

In the shops

After freezing at the factory, the method of transport and the conditions of storage in shops can have a material effect on the product. Deterioration may occur both through incorrect storage temperatures and dehydration of the peas if kept in open-top cabinets.

The best storage temperature for quick frozen peas is −5° to 0°F. The slight advantages of using lower temperatures are outweighed by increased costs. A survey, made at Campden three years ago, of temperatures of frozen peas in retail frozen food cabinets showed that the temperature of packages held in retail cabinets was not infrequently within the range of 10° to 20°F. Although these temperatures are too low for bacterial action to take place, deterioration in general quality can be several times faster than at 0°F. This is of little consequence in goods so stored for only a short period, but the quick freezers are alive to this problem and the shopkeepers are increasingly aware of the need to operate their cabinets efficiently.

The passage of water vapour through quick frozen packages in retail cabinets can give rise to serious losses in weight, and this can have an adverse effect on the quality of the contents. But such losses are infrequent; most types of package lose only 1–2 per cent of their weight after storage for a year at 0°F.

Besides the broad consideration of variety, maturity and storage, many other factors may have their effects on the quality of peas. These include the type of soil, nutrition and climate. Today the broad effects of most of these factors are known or under investigation. Very little is left to chance in what is now a highly organized industry.

V. D. Arthey, B.Sc. Hort., M.Sc., Ph.D., is the Horticultural Officer of the Fruit and Vegetable Canning and Quick Freezing Research Association, at Chipping Campden, Gloucestershire. He was previously a Research Assistant with the Agricultural Research Council and worked at Wye College on top fruit problems.

Where a little extra storage is required a high-moisture store may cost little or no more than providing storage for dried grain, says

High-moisture Grain Storage

Claude Culpin

IT is now several years since news came from France of milling wheat being stored in hermetically-sealed silos at moisture contents a little higher than those normally reckoned safe for bulk storage. It did not seem a very important piece of information at the time, especially as experiments subsequently carried out at the Pest Infestation Laboratory in Britain showed that grain so stored had a sweet 'fermented' smell, which was very persistent. Whatever other purposes sealed storage might serve, the preservation of milling wheat seemed unlikely to be one of them.

The experimenters suggested that the process might nevertheless be useful for preserving grain for stock feed; but most farmers were not prepared at that time to decide that sound grain could be used only as stock feed. In any case, simple equipment seemed prohibitively expensive, and methods of removing grain for use without spoiling the rest had still to be worked out.

So it happened that the practice of high-moisture grain storage for stock feed came to us some years later, from America, as one of the possible uses for a particular type of sealed silo. By this time, marketing and husbandry aspects had both altered drastically. The feeding of large quantities of barley to cattle had become an accepted practice, and with the very large amount of barley being grown, the attractions of the malting barley market had for most farmers disappeared. As soon as large quantities of barley were fed to cattle, the advantages of high-moisture storage, if it proved practicable, suddenly became obvious.

The first trials, by a few pioneering farmers, most of whom had little more than the silo manufacturer's assurances to encourage them, were satisfactory. Some farmers took risks which the silo manufacturers would not have approved, and yet avoided spoiling feeding quality appreciably. It was decided to study the technique at the Gleadthorpe Experimental Husbandry Farm, where work is now in its second season, and later at the Boxworth E.H.F., where experiments began with last year's harvest.

It is still early to lay down firm rules on several details, but some of the points which farmers who are thinking about high-moisture grain storage need to bear in mind can be made.

Exclude air

High-moisture grain has a marked tendency to spoil by spontaneous heating, associated with the development of moulds. Heated, mouldy grain is a very poor feed, and no subsequent treatment can put it right. Heating occurs most quickly if the grain is not only moist but also warm, damaged, or contaminated with greenstuff. In these circumstances heating may begin within a few hours of storing in bulk. The thing to do is—exclude oxygen.

There is, of course, a considerable amount of oxygen in the silo when grain is first put into it. But provided the silo is reasonably full and is sealed, the oxygen is quickly used up by respiration of the grain and the chemical changes produced by the various lower forms of plant life. It is this absence of more than just a trace of oxygen which makes high-moisture storage practicable. In these conditions the amount of mould growth which can take place is negligible. The temperature does not rise above about 80°F, and there is a rapid production of carbon dioxide, often considerably in excess of the quantity that would be produced by straightforward aerobic respiration.

Though growth of ordinary moulds is checked by lack of oxygen, the activity of certain anaerobic micro-organisms and mycelial yeasts continues, and it is these which ferment the grain and give it its characteristic smell. The type of fermentation in a sealed silo depends mainly on the moisture content. Whereas grain of 18–21 per cent m.c. changes little and has only a faint sweet smell, that stored at 24 per cent m.c. or over has a distinct smell similar to that of fresh brewers' grains, and the product contains appreciable amounts of volatile constituents, including alcohol.

Any continuous air leak which is sufficient to prevent the oxygen concentration falling to a low level will give mouldy grain. However, results to date indicate that with sound grain at the normal atmospheric temperatures prevailing between autumn and spring, letting in small amounts of air when taking out grain for feeding does not usually cause serious deterioration. So long as only a little air is introduced at a time, most of the oxygen is quickly used up, and the mould fungi remain inactive. But there are limits to the liberties that can be taken, and a careless practice which works well in winter may break down badly if continued into the higher temperatures that can normally be expected in summer.

Fill and seal

The aim should be to fill the silo and seal it as quickly as possible. In practice it may be necessary to spread filling over a period of about a week, but unnecessary delays should be avoided. For fairly short silos (up to about

***Tower Feeding**, as seen on the farm of Mr. F. H. S. Smith of Andoversford. The silo on the left holds 138 tons of moist barley, the other 200 tons of haylage. The forage boxes on the right bring material to the haylage tower, which is filled by the tractor-powered blower*

20 ft) a long auger which will deliver to the central filler opening is suitable, and generally fits in best on account of electric motor-drive and its usefulness for other purposes. For higher silos, a simple tractor-driven silo filler is needed. The silo should be sealed as soon as filling is completed; also at intermediate stages if the break is likely to be of more than a few hours.

Emptying

One of the most important details of a high-moisture grain storage system is the method of emptying the silo. Grain of up to about 24 per cent m.c. which has been kept air-tight normally flows reasonably well, but in some conditions not yet fully understood it at first sticks together and may bridge badly above conveying equipment such as a simple auger. The ideal equipment from a technical viewpoint is a combination of a sweep-arm auger and a horizontal auger. An air-tight cap over the horizontal auger stops air entering the silo except against the flow of grain as emptying proceeds, and this type of equipment can be used more than once daily if necessary. The sweep-arm auger is put into action only when grain no longer flows to the centre.

Cheaper means of removal include the use of a simple auger or of a flexible grain conveyor ('Snauger'). With either there may be difficulty when grain bridges. Some types of silo may have a simple auger sealed into one of three different pipes, and in this way it can be made to remove most of the grain. Alternatively, it may simply be pushed into a large-diameter shrouded opening, which permits the angle of use to be varied. This latter method may allow a considerable exchange of gases between the silo and the atmosphere, unless special precautions are taken, e.g., by sealing the gap with a plastic stocking. Similar considerations apply to the use of a flexible conveyor.

Simple and inexpensive means of removing grain may be satisfactory where use is only over the winter period. But where feeding has to be continued throughout the summer, a more fool-proof arrangement seems

preferable. There will doubtless be a rapid development of cheap and satisfactory emptying methods during the next few years.

In the meantime, while methods are being developed, farmers should beware of the great danger of entering a gas-tight silo which contains high-moisture grain. Suffocation from lack of oxygen can take place quickly, and without warning.

Handling after removal from the silo

The length of time that high-moisture grain can be kept before feeding depends on two main factors—moisture content and temperature; also on mechanical treatment and handling methods. Grain at 18 per cent m.c. taken out in mid-winter and kept whole will keep for well over a fortnight, whereas grain of over 24 per cent m.c. taken out in mid-summer and rolled, will start to deteriorate immediately. In less than a week it will be a very unattractive feed.

The best routine depends on many factors, chief of which is the ease with which grain can be taken out of the silo without letting in a lot of air. An ideal arrangement for removing grain is a flow system which takes the grain from the silo, through the processing machine and to the stock as they need it. But in practice, on many farms, a system of taking out grain for processing once or twice a week is quite satisfactory.

General management

Very little is yet known about the feeding values of various types of high-moisture grain. There are indications that the food conversion ratio with slightly fermented grain may be a little higher than with unfermented; but claims of 10 per cent higher feeding value do not so far seem to have been supported by adequately controlled feeding trials. At present, farmers would be well advised to assume that the chief advantage of high-moisture storage is that it provides a palatable feed, which is probably equal in feeding value to dried barley, and normally safer to use in large or fairly large quantities.

Experience to date indicates that for British conditions the range of moisture content from 18 to about 25 per cent is likely to be the most satisfactory. Within this range the grain handles well and keeps fairly well after removal from the silo. On balance there does not appear to be any advantage in aiming at higher moisture contents. Clearly, there is an important management advantage in being able to combine grain at a fairly high moisture content, without the cost or bother of drying it. On many farms which already have a drying installation, but where a little extra storage is required, a high-moisture store may cost little or no more than providing storage for dried grain. There are also many smaller stock farms with no existing bulk grain handling facilities, where provision of high-moisture storage could be almost as cheap in capital cost and cheaper in operating cost than any kind of drying installation. On both types of farm, high moisture sealed storage is worth considering.

Claude Culpin, O.B.E., M.A., joined the N.A.A.S. in 1947 and became the Ministry's Chief Farm Machinery Adviser the following year. He is stationed with the N.A.A.S. Liaison Unit, at Wrest Park, Silsoe, Beds.

***Sir William Mount** suggests that the odd corner on farms might well be used for growing*

Poplars and Cricket Bat Willows

Robusta poplars making a good start in damp scrub woodland

THERE is (or was) a custom in France that when a girl is born poplars should be planted to provide the money for her dowry. On a good site poplars for the match trade can be grown in twenty to twenty-five years, so there is a good deal of sense in the idea. Quite apart from France, many of those engaged in agriculture on the Continent also spend no small part of their working time in looking after the trees grown on their holdings.

There must be many farms in Britain, especially in the valleys, which have corners awkward to cultivate and streams along which either poplar or cricket bat willow could be planted. Not only would they beautify the countryside, but they would also provide the owner with a welcome cheque in the course of time.

Both species require much the same conditions—a reasonably high water-table but not too much stagnant water; of the two, the poplar is the more tolerant. The cricket bat willow, on the other hand, given a good site with free-running water, can mature in 14–18 years and be worth anything from £12–25 at the end of that time. The poplar is not so demanding as to its conditions but takes rather longer to mature—some 20–30 years—and its value is not so high, about £10 per tree.

Planting from cuttings

Both species can be grown from cuttings. The normal practice in the nursery is to put a nine-inch cutting in the ground and at the end of two or

three years to take the resulting stem and plant it either with its root, or again as a cutting. In the case of the cricket bat willow, the cutting (or unrooted set, as it is called) is probably the best way of planting. With the poplar, the rooted set is usually the more successful, except on a very wet site.

It is very important to make certain that you get your sets from a reputable nursery, which has good stock free from disease. Two-year-old sets should be 8–10 ft long; three-year-old, 12–15 ft. When planting the rooted sets, a hole, not more than 18 in. deep, should be dug. Plant the tree and press the soil well down. A little potash and phosphate sprinkled into the hole will help give it a good start. With the unrooted sets, a hole can be made with a wooden dibber and the ground moistened with a quart or so of water. The set is then inserted into the hole and the soil pressed well round at the top.

Light is essential for both trees. If in a plantation or group they should not be less than 8–9 yd apart—particularly so the willows. If, however, you are planting along the edge of a stream you can put them rather closer—up to say 7 yd apart.

For the first five or six years it is well worth cutting the grass and rubbish round the base of the trees and leaving it there as a mulch, but after that age this should not be necessary. Protection against hares and rabbits at the time of planting is usually necessary. Tie an old fertilizer bag or some straw round the bottom three feet of the tree. This should last for three years or so, by which time the bark will have become too tough to be attractive to rabbits or hares. This is much better than wire netting which, apart from being more costly, will cut into the bark as the tree grows.

Pruning pointers

For the first two or three years there is no necessity to prune the side branches but after that time the poplars should be pruned annually. A rough

Cricket bat willows need ample space, but they cast little shade and grass does not suffer

rule is from the age of four to eight years to leave two-thirds of the length of the tree unpruned, from eight to twleve years one-half unpruned and from then onwards you can prune higher, leaving only one-third unpruned, but this will probably mean using ladders. This may sound uneconomic, but in point of fact the cost of pruning with ladders works out at around 2*s*. per tree, and the results of this pruning can mean an additional yield of some 5–6 cu. ft, which at 5*s*. per cu. ft would be worth 30*s*.

If the cricket bat willows are growing well, the buds should be rubbed off the bark as and when they appear—preferably in May or June. The pruning of the poplar, on the other hand, should take place after the sap has stopped rising, say from September until Christmas. The cricket bat willow, however, does not need pruning to anything like the same extent as the poplar. When the tree is cut down it is then sawn into lengths of 2 ft 4 in., from which are cleft the actual blades of the bats. A maximum height of 11 ft is suggested as being the best; this will give four 2 ft 4 in. lengths with a little margin left over.

Varieties and frost

The main varieties of poplar grown in this country are Robusta, Serotina, Gelrica, and Eugenei. In addition, the Forestry Commission is experimenting with several new Italian varieties. My experience has been that some sites suit some varieties better than others, and it is often worth trying two or three varieties on the same site to see which does best. Poplar are slightly frost-conscious, and if the land is in a frost pocket it is probably wiser to use one of the later-flushing varieties, such as Serotina, rather than Robusta which flushes about a month earlier. On the other hand, Robusta is probably the faster grower where frost is not troublesome.

The cricket bat willow, however, is extremely susceptible to frost in its first year, and a severe frost late in May can cause havoc from which it is unusual for the tree to recover. When the tree is two or more years old, however, a late frost appears to have little effect.

In suitable circumstances, and provided at least one acre is planted in one year, the Forestry Commission offers a grant of £21 per acre for the planting of poplars, but not for cricket bat willows.—Editor.

SIR WILLIAM MOUNT who, on his 850-acre farm near Aldermaston, Berks, milks 100 Ayrshires, has 450 acres under corn, 20 acres under potatoes, and also owns and manages 500 acres of woodland

Group Trading

THE PATTERN OF CO-OPERATION EMERGING UNDER A.C.T. IS DESCRIBED BY

J. Rhys Thomas

By comparison with 'Big Business', almost every farmer is a commercial pigmy. Any business having a proportion of its raw materials sold to, and its finished products bought by, the same organization is in no position to trade sensibly or effectively unless it is comparable in size to those with whom it trades.

The past five years have seen the formation of many farmers' groups for buying and selling. Most of them are comparatively small (15–40 members) and the fundamental principle in each case has been, and always will be, to multiply the requirement or the sale of a product by the average need or product available for marketing within the group. Thus a group of twenty-five farmers requiring, on average, say 25 tons of fertilizer per member per year, can establish an annual group need of 625 tons; or, a group having 150 lambs per member to market can furnish a group sales programme of 3,750 lambs. These examples point to a practical, sensible, and in the face of current trends, necessary, pattern of co-operation.

The swift development of the group trading idea over a varied sphere of interest and activity automatically brought in its wake a need to seriously consider the next phase, or if indeed whether any further action was necessary. If history was not to repeat itself in continuing commercial incursion into agriculture, the need for prompt and decisive action soon became evident. This was taken by the sponsors of the group trading movement in several parts of the country and, together with the loyal support of the groups themselves, patterns of regionalized groups emerged over a very large area of England and Wales.

Agricultural Central Trading

With the basic structure of agriculture in danger of being undermined by ancillary commercial forces, the regional group organizations did not have, nor could have within themselves, enough strength to achieve objective

co-ordination. At this stage the N.F.U. formed a national commercial organization—Agricultural Central Trading Ltd. This organization has been commercially operative for nearly two years now and is expanding quickly under the support given to it by more and more groups (either new or originally independent) and increasing membership.

So much for history: suffice to say that in just five years a pattern of co-ordination has been created which has an in-built capital and representation structure, and this, if properly and wisely administered, should ensure that the resources of the industry are fully utilized before other forms of long-term financing need be examined. Contrary to some claims that such an organization is just an extra link in the commercial chain, it is in fact ruthlessly streamlined; each group is linked to its region with its regional responsibilities and opportunities, and each region is linked to the central office for negotiation and overall administration. What could be simpler? Already many millions of pounds saving annually to all sectors of the industry can be claimed.

Every care has been taken to ensure that the voices of groups can be democratically transmitted along the line through the Regional Group Traders' Associations; also that the large reserve of commercial acumen of individual group members or groups can be made directly available to the Regional or Head Office of Agricultural Central Trading Ltd.

Pattern of development

Nationally co-ordinated group trading is here. In what way should it develop? To return to the types of groups which already exist—purchasing, selling, or an admixture of both: irrespective of the type of farming practised, there is a high degree of commonalty in the form of requisites needed. Even in the case of highly specialized types of production, such requirements as fuels, fertilizers, machinery, tyres and batteries are supplied from the same sources which supply general agriculture.

This then gives us our first group type—the requirement group—and with its membership drawn from the common local pool of Britain's mixed farming, each group in this category will meet with reasonable frequency and will be serviced by a member of the Regional Staff of Agricultural Central Trading Ltd.

The second group type—produce marketing groups—will, on the other hand, tend to become more specialized in their membership, meeting much less frequently say, two or three times a year, with the final details of organization being completed by telephone or post.

Future expansion is not limited to the two main types of groups referred to, but can and certainly will include groups of an inter-trading nature within the industry such as calf and weaner groups. The success of all three types of groups depends in a large measure upon an understanding by individual members of the reasons for, and the ultimate aim of, group trading, and a preparedness to accept the need for the individual to plan ahead and where necessary to enter into contract.

Requisite groups would ideally operate on a form of contract. This would almost certainly not be acceptable in the present stage of fierce competition which groups themselves have helped to create, but much of the desirability for contracting is minimized by forward planning and ordering; also by the understanding of individual group members why other sources of supply

drastically reduce terms in areas of group activity. On the other hand, marketing groups and inter-industry trading groups can only operate under contract—one which starts with the buyer and for which, through the group system, responsibility for fulfilment lies with the group or its members individually.

Group trading is today's expression of the same basic need which motivated our forebears in the formation of Agricultural Co-operative Societies. The individual farmer may well be a member of each type of group, linked and organized to present a picture of complete and effective co-operation, within which the best long-term interests of farmers will be served.

J. Rhys Thomas, who is a farmer's son and himself farms 520 acres in Herefordshire, was a sponsor of group trading and is a Director of Agricultural Central Trading Ltd. He was Chairman of the Herefordshire Branch of the National Farmers Union in 1950 and was Vice-President of the Union in 1959. Mr. Thomas travelled in the U.S.A. for three months in 1958 on a Ford Foundation Scholarship.

Nigel Harvey

summarizes available information on an important member of the agricultural community

The Part-time Farmer

In 1960 an investigator asked thirty-five West Country farmers why they didn't keep pigs. They gave a variety of reasons for not doing so, but the main one given by ten of them was their preference for other kinds of work—*off* their farms. A similar inquiry in another area would have produced a similar answer, for a surprisingly large proportion of our farmers earn a part-living by working at another job. But how part time are part-time farmers? And what do we know of their importance in the general pattern of farming?

The normal classification, which defines farms requiring less than 275 man-days per year as part-time farms, is admittedly rough-and-ready. Some farmers find their so-called 'part-time' holdings require their whole-time efforts. But it is a reasonable assumption that most part-time farms are run

by men who have other interests. Sometimes, indeed, they are run by spare-time farmers—men whose farms play only a small part in their lives.

How many are there?

The number of part-time farmers is considerable. According to the latest analysis, there are in England and Wales some 170,000 part-time agricultural holdings as against 180,000 full-time holdings. So about one farmer in two is a part-timer. In a survey of 116,000 of these farmers undertaken five years ago, it was found that some 13,000 had a part-time job off their farms, some 41,000 had a full-time job off their farms. Most of the others, many of whom were retired men, including farmers who had retired from larger acreages, had a source of income other than that from their farms.

Most part-time farms, of course, are small—nearly always under 50 acres, and generally under 20 acres. In one local survey, they accounted for 31 per cent of the total number of farms but only 3 per cent of the total acreage. In another they averaged no more than 8 acres. And they vary enormously in character. At one end of the scale there are highly intensive small farms which, like other small farms, tend to concentrate on pigs and poultry; in one county, part-time farms carried 13 per cent of the pigs and 14 per cent of the poultry on 3·6 per cent of the acreage. At the other, they are little more than glorified allotments or accommodation land.

The other job

The most common off-farm job is working on somebody else's farm, but the list of other occupations is varied in the extreme and, as is to be expected, greatly influenced by area. In intensively cultivated districts, many are dealers, hauliers or contractors. The importance of the latter was shown by a survey in the East Midlands, where 8 per cent of the area's tractors were on 3 per cent of the area's land. In the West Riding, many are industrial workers; in Wales, quarrymen, miners or forestry workers; in the West Country, hotel-keepers. It is no accident that we are so well-informed on these second trades, for research workers have concerned themselves as much with the social as with the agricultural importance of the part-time farm. In particular, they have looked at the possibilities of part-time farming as a way into and a way out of full-time farming.

No easy way to the full-time farm

In principle, a part-time farm seems a likely rung on the farming ladder. Certainly, a number of part-time farmers so regard it. Two North Country surveys found that about a fifth of the part-timers interviewed planned to farm full-time, while a number had made 'vigorous efforts' to increase the size of their holdings to an economic level. And it is possible to quote individual success stories. The foundation of Thornber Bros. of Mytholmroyd by a weaver who ran chickens on a few acres is a matter of history. But a more recent instance is that of 'Evans the Cubicle', one of the most famous small farmers in the country, who graduated from railwayman to full-time farmer by way of a part-time holding run by his wife when he was away.

Yet in practice it seems that relatively few part-time farmers do in fact make the change. For many, it is difficult to accumulate the necessary capital,

difficult to acquire more land locally, difficult to rent or buy a small farm, difficult to abandon the outside earnings. In the words of one investigator, 'you begin with the idea that it is only for a year or two. But growing family commitments and a reliance on a weekly wage make it progressively harder to break away. Working your way into land is not an easy task'.

A means of retirement

The part-time farm has probably more to offer those at the end of an agricultural career than those at the beginning, for it offers the elderly farmer a means of retirement, an easing of the demands of a full-time farm without a complete break from his lifetime's work and interests. An inquiry in Yorkshire, for instance, found that nearly a fifth of the part-timers interviewed were retired farmers. Significantly, too, national figures show that only 4 per cent of part-time farmers are under 30 years old, while 28 per cent are over 60; the average age is 52, five years above that of all farmers.

Will part-time farming increase?

More generally, part-time farming meets a number of social needs. It provides an outlet for farming interests; it keeps men in the villages and so maintains local income and labour supply; and, above all, it gives those who undertake it a feeling of independence and a possibility of advancement through their own personal efforts applied to their own personal businesses. Few want to abandon it, and in some areas at least the demand for part-time holdings is brisk. Indeed, the present question is not the continuance of part-time farming, which is assured, but its possible increase.

For the familiar economic pressures which are causing the amalgamation of some small farms into larger units may well convert others into part-time holdings. Systematic information is lacking, but it seems that a number of small farmers are turning to secondary trades, such as contracting, selling eggs at the farmhouse gate, or letting rooms or caravan-space to holiday-makers, so that their farms continue as only partial agricultural holdings.

Part-time farming has its difficulties and limitations as well as its rewards. But it also seems to have a future.

R. M. PATERSON

COWS and ACRES

The story of Rex Paterson

T. WANNOP WILLIAMSON

THE year 1929 saw the creation of a new farm. Situated in remote country, near the point where Hampshire, Wiltshire and Berkshire meet, it comprised 400 unwanted acres of chalk downland, all in grass. The useful fixed equipment consisted of barbed wire fences and, for farmhouse, an ex-army wooden hut of first-world-war vintage. Water was available at the bottom corner. Such was New Zealand Farm, Chute!

Toss of a coin

The young man who took over this uninviting property, Rex Paterson, cheerfully confessed to an urban upbringing and, in fact, to limited farming experience. He had spent a few years as a farm worker, including four years in Canada, and his last job had been as cowman on a Hosier bail in central Hampshire. He and his employer had agreed on a bonus scheme based on profits, but at the end of the year they found that the wording of the contract could be interpreted in two ways, one much more advantageous to the employee than the other. To settle the matter, they decided to spin a coin and abide by the result. Rex Paterson won.

That penny was surely one of the most fateful coins in the annals of English farming, since bonus plus savings provided the capital of £500 used

as down payment for farm, 60 cows and a Hosier bail. He and his young wife (who were also to comprise the regular labour force), moved into the wooden hut, cows and bail arrived, 200 acres grazing were let off for six months, and a new farmer was in business.

Few people could have expected much from this inauspicious start—the farming depression was at its nadir, men were leaving the land and farms were falling derelict. The newcomer had transgressed the then current rule 'Borrow on mortgage to buy a farm if you must, but never borrow for working capital or you'll be in trouble'. Indeed, had it not been for two shrewd local farmers who believed in his ability and backed him financially, it is very doubtful whether Rex Paterson would have found anyone who foresaw much of a future for him in farming. What, then, were the keys to his astonishing success?

Flair for dairying

Undoubtedly skilful stockmanship and unflagging interest in and understanding of dairy cows played quite a big part (few farmers make much profit from stock they dislike). But allied with a flair for dairying went a keen analytical business brain, as he demonstrated when he first improved the farm and then took out a mortgage to cover the whole cost. He was, in fact, one of the first of a new race of farmers—men who would deliberately make the utmost use of all available credit to expand their businesses. This cash was used as working capital. After attaining farmer status he did not again seek long-term credit for land and fixed equipment. Once he had managed to get on his feet he sold New Zealand Farm and used all the money he could lay hands on to buy cows and portable bails for farms which he rented. Apart from a small scrap of land which again he soon resold, he did not reappear as a landowner until the middle 'fifties.

And he kept his farming system simple. On New Zealand Farm he maintained a flying herd of cows fed on grass, hay and cake—no other stock or crops—and this remained the pattern on his growing acreage until the ploughing-out campaign of the second world war. Soon, too, he appreciated the value of business data, and his office organization kept pace with his growing acreage.

His war-time farming was something of a digression from his chosen path. Vast changes were made. First he acquired considerably more land, including areas which had been derelict for twenty years, and before the end of the war he was farming 10,000 acres. The holdings he rented were spread right across North Hampshire and over the Sussex border, and included some land unsuitable for dairying on which for the first time he was rearing some of his home-bred heifer calves as replacements. But more significant of his war-time effort, fewer cows were kept, a large acreage was ploughed up for cereals, and his potato acreage was the highest in the county.

Post-war grass pattern

After the war came rehabilitation, adaptation and consolidation. Rex based his policy on the proven fact that he could obtain higher output and profit per acre from milk than from tillage, and on the premise that to meet future competition he must aim at getting the cost of milk production down to about 2*s.* 6*d.* per gallon. He therefore gave up areas less suitable for his purpose and reverted to a simple farming system, though he found it

This fixed milking bail, with walled collecting yard, is a good example of the simplicity of the fixed equipment used by Rex Paterson

necessary to change his dairying operations in two important respects. As cake was no longer cheap, he based his winter feeding programme on grass silage instead of hay and concentrates, and his pre-war policy of importing Shorthorn heifers from Ireland gave way (after experimenting with Jersey-Shorthorn crosses), to concentration on Ayrshires and Friesians and rearing his own replacements.

Thus from the end of the war until very recently the story has simply been one of increasing cow numbers at the expense of cereal acreage, feeding the cows largely on grass and grass silage, and rearing dairy replacements. His techniques have been explained too often to need reiteration here.

The aim of low-cost production was pursued with determination and keen intelligence. Investigations in the field were backed by close and continuous analysis of results in the office, and the lessons and deductions placed fully and openly at the disposal of all farmers. In the office, for example, are graphs showing production and financial returns from comparable herds of cows calving in every single month of the year; likewise the feeding of concentrates at varying levels, and the effect of individual cowmen on yields. Elaborate analyses perhaps, but invaluable not only because they serve as guides to the business conduct of a large organization, but also because they cover so many herds of commercial cattle, under the same management, and are therefore of much more general application.

Full use was made of one fortuitous discovery. One of the farms first turned over to dairying at the end of the war, was in an area which had suffered badly during the slump, and had too few habitable cottages. Consequently one or two of the herds were milked by labour (which soon proved transient labour!) housed in caravans, and with very little supervision. Expensive cake wasn't ever likely to be properly rationed under these conditions, so it was decided to let these bails produce temporarily what they could on grazing and silage alone. To Rex Paterson's pleased surprise, yields remained satisfactory, so the idea was extended to all other herds, with results that he has described on many platforms.

Heavy stocking on good swards

Dairy farming profits are largely determined by the number of gallons of milk produced multiplied by the margin per gallon, and are maximized by juggling with these two figures to get the highest result. In the Paterson enterprise this has been secured by obtaining the highest possible gallonage

per acre through fairly heavy stocking rates on high-grade swards properly utilized and conserved. Cake feeding increased the yields very slightly at high cost, and reduced the profits. The absence of concentrate feeding is not, however, carried to absurd extremes, since under his bonus scheme any stockman is still free to feed as much concentrate as he wishes; but enough gallons are deducted to pay for the concentrates before the quantity qualifying for bonus is determined.

The post-war development which greatly facilitated Rex Paterson's own farming practice (to say nothing of many other farms) was his invention of the tractor-mounted buckrake. Grass silage made in a pit or clamp at once became an easy job and virtually superseded haymaking on the Paterson farms. Cheaply-made silage is the foundation of low-cost winter milk, though of late, in order better to fit in with his farm organization and to obtain the high output of silage per man-day necessitated by a bigger dairy herd, he now uses forage harvesters in place of mowers for cutting, with buckrakes handling the grass at the clamp.

Simple organization

Naturally with a business embracing cows and acres numbered by the thousand, spread over farms separated by considerable distances, thought had to be given to post-war managerial organization. Here again, effective simplicity is very much in evidence. The basic unit in Hampshire is an area of 120 acres, carrying a herd of 60 cows. Three men provide the labour force for two units. In many ways each unit is self-contained with its own independent equipment, but two units share one forage harvester, and some items of machinery in less frequent demand are shared by all the units on the farm. The farms vary in size between 600 and 1,500 acres, and each has its own manager who is directly responsible to Mr. Paterson (or if he is absent, to his chief assistant) at Hatchwarren.

There is nothing startling about these figures. Many chalkland farms devoted to dairying can obtain the same output and, by participating in

Part of one of Rex Paterson's commercial herds

machinery syndicates, can keep down equipment costs. The Paterson dairy-farming business therefore simply consists of little more than a series of conventional-type dairying units under one management.

Once the boundaries of the post-war units were settled, it became more convenient to fix the milking bails on concrete, with walled collecting yard and space nearby on some dry spot for two silage clamps. These milking bails (two main patterns) were erected by the tenant, and in fact, by agreement, Rex Paterson has in many cases taken over from the owners the responsibility for providing or modernizing the limited fixed equipment he needs. The effect has been to keep the rent charge within reasonable bounds—again directly helping low-cost production.

Venture in Wales

The advantages of owner-occupation were at the back of Rex Paterson's mind when, in the mid-fifties, failing to find suitable additional land to rent in Hampshire, he bought farms in that noted dairying district on the borders of Pembroke and Carmarthen. His home and headquarters, Hatchwarren Farm, is on the edge of rapidly expanding Basingstoke, and a motorway is planned to pass by his dining-room windows.

This venture into Wales was frankly regarded as experimental, since the Hampshire organization and farming system would have to be adapted drastically to high rainfall conditions. The first difficulty was to recruit local labour, brought up to cowshed milking on smaller farms (a problem not unknown to other farmers), yet adaptable enough to become efficient cowmen on large herds bail milked. The search and subsequent training, together with the job of building an appropriate organization, devolved upon Rex Paterson's son, John, as manager of the Welsh farms. The first phase is almost over; and a summary of the results of the enterprise is expected shortly. Already the dairying units are larger, and spring calving is the rule.

His post-war decision to reduce cereals and increase dairying was the biggest surprise he sprung on his neighbours—most chalkland farmers have done just the opposite. He was able at the time to obtain higher returns and profits per acre for milk than from corn, he preferred livestock, and cereal growing interfered with the steady labour utilization plans worked out for dairying.

He confesses to one particular disappointment. Always he has been willing to fill vacancies on his labour force with novice entrants to farming, who wanted to make their careers on the land. He has been surprised to find how few of them have remained in the industry for any length of time.

Such then is a brief account of the career and achievements of a modern pioneer, one of the men who introduced business methods of analysis and finance into agriculture. Here is no brash business tycoon; on the contrary, he meets all men with gentlemanly courtesy, and he speaks and advances his opinions with modesty. And he has no time for status symbols. Rex Paterson came into farming for no sentimental reason; he intended to make money, and he succeeded in full measure.

T. Wannop Williamson, B.Sc., N.D.D., spent twenty-seven years in Hampshire, ten of these as County Advisory Officer, until he became Deputy Regional Director of the N.A.A.S. at Starcross (1957–63). He retired last year.

T. C. Carter

The computer takes over analysis

Operational Research

A third channel of scientific inquiry

THE scientist is traditionally thought of as a white-coated, long-haired individual who spends his time in a laboratory doing experiments. But whilst white coats are still common scientific clothing, the mean hair-length of scientists is almost certainly shorter than that of the Beatles, and much scientific research nowadays involves neither laboratories nor experiments.

The essential feature of a biological experiment is the 'experimental comparison'. The experimental subjects—wheat plants, chickens or whatever—are formed into two groups. One group ('the control') is managed in the way in which such things are normally done. The other (the 'experimental' group) is managed in a way that is similar in all respects except one, namely the 'experimental treatment'; the experimental group of wheat may be sprayed with a new pesticide, the experimental group of chickens may be given a new coccidiostat. The control and experimental groups are observed and measured, and their yields are compared. If the yields differ, the difference is attributed to the experimental treatment.

In practice, of course, experimental design is much more complicated than this: much sophistication must be introduced into the experimental design to reduce the risk of yield differences due to other, unsuspected factors, rather than the experimental treatment. But the underlying principle remains the same; one group is exposed to some experimental treatment and is compared with a group treated in a way that is identical except for the experimental treatment.

The cost of such an experiment is the cost of the experimental treatment and of making and analysing the observations, less the value of any yield increase in the experimental group. Sometimes, however, experimental treatments prove to be deleterious: the yield is reduced. The cost of the experiment (if it is a large one) may then be high. It is therefore desirable to avoid experimental treatment of valuable material if the information needed can be obtained without it. In most situations it cannot: the effects of a pesticidal spray, for example, cannot be discovered without using the pesticide. There are some situations, however, in which information about the effects of changes in treatment can be obtained without making the changes experimentally. Such situations arise where small changes of treatment occur in the course of normal agricultural or industrial operations. Operational research includes the study of such changes and their effects.

The hatching egg

Consider, for example, the eggs incubated in a large broiler hatchery. They probably came from many different supply flocks. The parent birds may have been of several different strains; they were almost certainly of different ages and the flocks of different sizes. The eggs were probably held under differing conditions of temperatures and humidity on the farm, and for different lengths of time before being taken to the hatchery. At the hatchery they may have been held for different lengths of time before being trayed, fumigated and set. They may go into any one of many different setters, and in the setter they may go into any one of many different positions. They may be transferred to the hatchers at different stages of incubation, the 18th or 19th day. They may go into any one of many different hatchers, and to any one of many different positions in the hatcher.

Every one of these factors—and many more—may affect the probability that a first-quality chick will hatch from the egg. If records are kept of the histories of a sufficiently large number of eggs, and they are subjected to appropriate statistical analysis, it is possible to estimate the extent to which each factor affected the probability that a first-quality chick would hatch; and from this it is possible to identify the causes of sub-optimal performance.

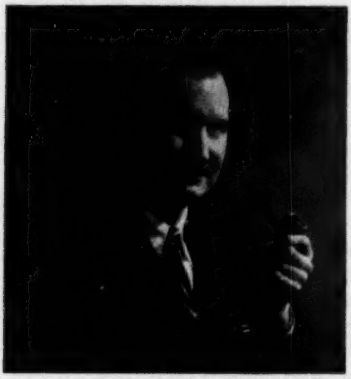
Data for the computer

The raw material for operational research consists of records of normal operations. This is not to say that the normal records are always sufficient: often they are not, and a necessary prelude is then to arrange for the collection of the data in a form suitable for analysis. (It may be found, when the records system is investigated, that the necessary increased amount of information can be collected with less effort and less paper-work than before; this is a valuable, if unexpected, by-product of operational research.) It may also be necessary, as a prelude, to make minor changes of operational procedure; for example, in many hatcheries the eggs from a given setter always go

into the same hatcher, not because this is necessary but simply because it has always been done that way. It should be changed, because without the change the effect of the setter on hatchability cannot be distinguished from that of the hatcher.

Once these changes have been made and data-collection has been streamlined, the data are allowed to accrue for a period of time, perhaps months, in the course of which millions of eggs, from thousands of consignments, may have been incubated. They are then analysed.

There is only one feasible way of handling such a mass of data, namely by transferring them to punched cards or tape and analysing them in an electronic computer. The computer time required may be no more than a few minutes. The analysis will show the average effect on saleable chick percentage of each of the factors recorded; and this will show where improvements in operational procedure could be made. With such a large mass of data analysed, even small effects—fractions of one per cent—can be detected. Though numerically small, they may be financially very important when applied to a year's throughput.



T. C. CARTER, O.B.E., D.Sc.

Director of the Agricultural Research Council's Poultry Research Centre at Edinburgh

Without disturbance to normal work

The characteristics of operational research are that it causes little disturbance to normal operations. It is cheap, it is essentially a statistical exercise, it operates on enormous amounts of routine data (which are analysed on an electronic computer) and it identifies the causes of loss of efficiency. Quite often it happens that operational research identifies a problem that cannot be solved without experimental research, but without the operational research the problem would have gone undetected and efficiency would have remained at its former, lower level.

Operational research of this sort is particularly applicable where large amounts of numerical data accrue in the normal course of operations. A large hatchery is an obvious example, but there are many others. What are the factors responsible for cracking in eggs, and how much responsibility does each bear? Breed of bird, age of bird, feed, type of cage, manner of collecting eggs in the house, number of eggs per basket, method of cleaning, position in the Keyes tray, position of the tray in the box, distance travelled

to the packing-station, type of lorry, identity of driver, day of the week, identity of the grading operative, identity of the packing-station, and identity of the area grading supervisor. The extent (if any) to which each of these factors affects the reported amount of downgrading can be investigated by operational research methods. The data from a single farm will not often be sufficiently extensive to form the basis for such investigations, but these are days in which farmers are increasingly coming together in co-operatives and groups, and the data from a whole group can be very informative. The larger the group, the more informative, in general, the analysis will be and the greater the improvements in efficiency that can be made.

A complementary type of research

Operational research was born (and received its name) during the late 1930s, when the maximum amount of usefulness had to be squeezed out of the information provided by the early radar sets then coming into service with the Royal Air Force. It developed rapidly during the war, and reached maturity with the development of the electronic computer. It has now taken a place alongside the two other main types of research—basic experimental research and applied experimental research—as an essential component of technological advance. Agriculture cannot afford to neglect operational research any more than it can afford to neglect the other sorts. They have different functions to perform, but they are all essential to an industry that hopes to become and remain fully efficient.

International Agricultural Pilots' School

It is proposed to establish an International Agricultural Pilots' School at the College of Aeronautics, Cranfield, Bedfordshire.

Some 11,000 aircraft are in agricultural use throughout the world, and the number is increasing all the time. The course and the school will be open only to pilots who hold a Commercial Pilots' Licence (C.P.L.) or have received an equivalent preliminary training. The school will be particularly important for the training of pilots from developing countries. Pilots will be trained in flying technique in aerial application (35 flying hours), safe handling of agricultural chemicals, application methods and equipment, and operational planning and organization.

The duration of each course, which will be given in the English language, will be about 6 weeks. Students who have successfully completed the course will receive a certificate. The fee (inclusive of living expenses) will be about £550. Students from developing countries who have been nominated for this training by the government of their country may, in principle and within certain limits, be granted a fellowship.

The opening of the International Pilots' School has been planned for October, 1965.

For further information and application for participation in the Agricultural Pilots' Course, write to International Agricultural Aviation Centre, 1e v.d. Boschstraat 4, The Hague, Netherlands.

Less Waste with Hay

ONE of the main problems when feeding hay is to avoid waste. Sheep and bullocks are selective feeders and they pull out more hay from the rack than they can eat in a mouthful. Any surplus falls to the ground and is generally trampled on and thus wasted.

Several types of rack have been made or modified at the Drayton Experimental Husbandry Farm over the past three years. The old racks were of the tumbril type, with a gap of 2 ft × 4 in. between the bars for feeding. This has now been reduced to a 3 in. × 3 in. mesh, through which even 9½ cwt bullocks can feed successfully.

The bullock racks are made on the farm of a ¾ in. water-piping framework with 3 in. × 3 in. welded mesh tacked on. The wire mesh used is of 10 gauge thickness, though 8 gauge would be better. The racks are made by bending the 8 ft × 4 ft sheets of welded mesh into a right-angle to give a 2 ft 6 in. feeding face and 1 ft 6 in. on the filling side. The racks are sloped away from the bullocks at the bottom, so that they feed off the underside. The 3 in. × 3 in. mesh has caused no difficulty to the animals, which pull out sufficient for a mouthful with very little wastage. Waste is cut down further by placing the rack outside the tubular cattleyard fence and a trough underneath the rack to catch any small pieces which fall through, so that the bullocks can pick them over again. The bullocks have also been fed through a 3 in. × 2 in. mesh, though the hay requires more teasing out from the bale than with the 3 in. × 3 in. mesh.

The Norwegian type of hay-box is also used. This consists of a sheet of 6 in. × 3 in. mesh placed over a square wooden trough, and the animals eat the hay through the mesh. This type of trough is not so popular on this farm because it takes more time to fill than the racks, cleaning out is not so easy and the mesh has become bent from constant pulling by the bullocks.

For sheep, the standard outdoor racks have been modified by restricting the feeding face to the bottom 10 in. only, and blanking off the top 12 in. with galvanized sheeting. In addition, two ¼ in. square mild steel bars have been welded inside the racks across the uprights to reduce the size of the gap even more. They are, in fact, about 2½ in. × 3 in. On the indoor racks 3 in. × 2 in. welded mesh is used for the 8 in. deep feeding face.

With both sheep and cattle, the use of the mesh type of rack has cut wastage considerably without restricting the animals' appetite. More of the hay is going into the stock, and less on the floor.

After a few days air drying the cheeses are packed into nylon bags. They can then be stored two deep on the shelves

Caerphilly

Kathleen Maddever

ONCE merely a local product of farmhouses in the area of the Welsh town near Cardiff from which it takes its name and the 'staple diet' of miners, Caerphilly cheese is now known and justly appreciated far beyond the compass of the Principality. The cheese made today is much firmer and more acid than that made thirty or so years ago, though the original was reasonably firm, white in colour, fairly short-textured and always well matured. But like all other types of territorial cheeses, the actual texture and flavour vary according to the area where it is made and the demands of the market.

Caerphilly is particularly popular because of its mild flavour, and its comparatively high moisture content prevents it going dry too quickly when kept in a warm atmosphere. In olden days during the months of April and May, the Welsh Caerphilly cheese-makers used to call it 'cuckoo cheese', meaning by this that they had added ewes' milk (very rich in fat) to the cows' milk which at that time of the year was, of course, rather short of fat and solids-not-fat.

Somerset takes over

But Caerphilly is no longer purely a Welsh product; indeed much of the Caerphilly eaten in Wales today is made in Somerset, by reason of the fact that the demand in Wales was greater than they could meet locally. And most

of that is now made in creameries rather than on farms. For many years, most of the Caerphilly cheese made on the Somerset side of the Bristol Channel was sold by auction at a special cheese market held at Highbridge every Tuesday. This market dates back to 1775, and just before the turn of the century was controlled by the Cheese Market Trust. In the early 1800s, however, it was felt that a special market for Caerphilly cheese should be provided and this was erected in the Cooper's Arms Yard and controlled by the original firm of J. H. Palmer and Toogood, which eventually became J. H. Palmer and Sons. Mr. David Palmer of this famous local firm is the grandson of the first J. H. Palmer.

The largest quantity of cheese sold at any one market was 100 tons, but the average was about 20 tons a week. Buyers came from widely scattered districts and price varied considerably from week to week. I remember it being as low as 35*s*. a cwt up to an all-time high of 240*s*. a cwt. The cheeses brought to this market were arranged on the shed floor in groups called 'parcels', and a wide path was left between the rows so that the buyers could sample the cheeses for flavour and texture and inspect them for finish, which was very important. It was an unforgettable sight, and probably some of the best judges of cheese quality were the men employed by the market authority to unload and stage the cheeses! An interesting feature was that one never knew where in the enormous market the auctioneers would begin to sell. It was entirely in the lap of the gods whether prices started high or low and just where one's own parcel of cheese would be staged.

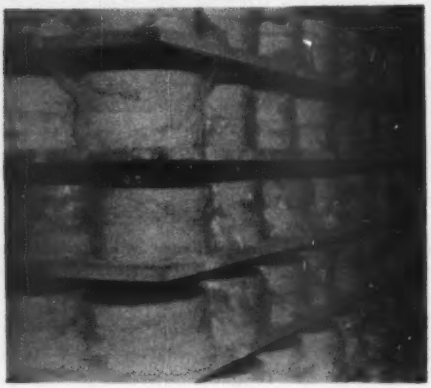
Nowadays makers find their own market direct and much of the cheese is pre-packed for supermarkets. But wrapping foodstuffs in nylon or laminated plastic films can be a mixed blessing, for if a cheese with a high moisture content is stored too long, especially at a high temperature, the cheese develops a very strong flavour, not at all pleasing to the palate.

Restriction and resumption

Throughout the period between the two world wars many of the smaller cheese-makers in Somerset made Caerphilly all the time during what they called the 'season'—i.e., from about April to the following September or October. This was marketed at about two weeks old and, because less expensive equipment was needed, it had a quick turnover. Again, in the 'thirties some cheese-makers made only Cheddar cheese during the season (April to October) and Caerphilly during the winter; for it was generally believed at this time that it was only safe to make Caerphilly cheese during the cold winter months because the low acidities required could be attained, even though the making-room temperatures were often low.

When rationing came with the war in 1939, the market had to be closed, and Caerphilly was made only in the factories; few farmhouse makers were trained and much of the equipment was sold.

However, when the manufacture of territorial cheese was once more permitted, after a break of twelve years during and after the second world war, Caerphilly cheese manufacture was resumed on a few farms on a much larger scale and great improvements were made to the type of equipment used. Mechanical paddles were often employed to do the stirring and in some cases the curds and whey were run from the vat at a higher level on to the cooler at a lower level. It was at this lower level that the curd was drained, cut, salted and then packed into the moulds. This, of course, saves much lifting



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and avoids all the undesirable bending which had to be done when the curd was both salted and put into the moulds on the bottom of the vat in which it had been made.

Making the cheese

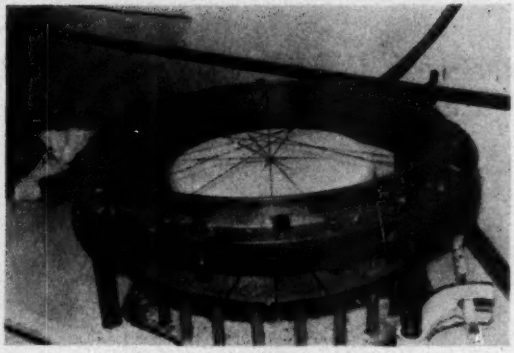
First, great care must be taken to see that the night's milk is not chilled unduly, because this will give a pasty, sticky-textured cheese. When the morning's milk is added to the night's milk in the cheese-making vat, an inoculation of 2–3 per cent starter (lactic acid culture) is made. Rennet at the rate of 1 dram to 3 gallons of milk is next added, and after 35–45 minutes the curd is cut into cubes about $\frac{1}{4}$ inch square. The curds and whey are seldom heated to more than 90–96°F. When sufficient acidity has developed the whey is drawn off, and then starts a most interesting part of the making technique. The curd is cut and put into large cone-shaped piles at the side of the vat. And what a trial this job is to the beginner! If he fails to put enough slope on the knife when cutting the side of the pile, most of the curd will fall back into the whey which is running down through the centre of the vat. When the cone-shaped piles have been achieved, they are sliced into long wedge-shaped pieces which again are piled at the back of the vat in a layer about 10 inches deep. The acidity in the curd at this stage may be about 0·32 per cent lactic acid. Subsequent cutting reduces the curd to pieces about 1 inch square.

The curd is then stirred and salted, using 1 oz of salt to 3 lb of curd, then packed into circular moulds. These moulds are fitted with a shallow collar which is loose and can be raised so that the mould can hold a precise amount of curd. As the cheese is pressed, this collar sinks in the mould and so ensures continuous pressure on the cheese.

The next problem is getting the cheese piled in the presses. When the old-fashioned upright presses are used it is a highly skilled job to get an absolutely vertical pile of 12 or 14 moulds before the pressure is applied. If, of course, the cheeses are piled crookedly in the press then the finished cheese will be uneven and misshapen. The cheeses are turned twice while in the press so that they may have a good finish on the outside. The cloths in which they are pressed are wrung out of salt water and then the cheese is put top to bottom and returned to the press.

If, by chance, the cheese curds should have been made from milk which was not of good keeping quality, or if the cows had been fed on something

The final cut before the curd is salted and weighed into moulds



A mechanical cutter is used to produce attractive wedges of cheese for the supermarket

like fermented apple pomace, Caerphilly cheeses have been known to 'blow out' of an upright press—presenting a sorry sight to the cheese-maker when she turned up for work at six o'clock next morning!

After twelve hours pressing the cheeses are removed from mould and cloth, and put into an 18–20 per cent brine for twenty-four hours. This brine is not always made scientifically, but the old-fashioned method was most effective. First some water was boiled and then salt was dissolved in it until the solution was strong enough to float an egg. (The question always was, of course, how much of the egg should be above the brine, and anyway eggs vary a great deal in size!) If this brine is too weak the cheese will develop what is known as 'slip coat'—a bad fault.

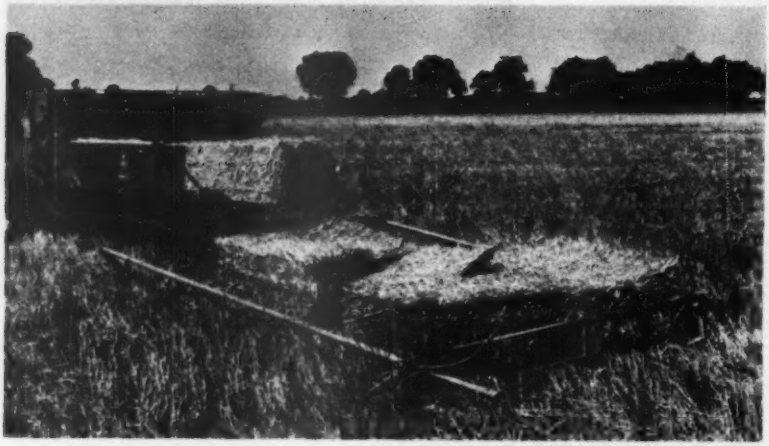
Good Caerphilly cheese, after it is taken out of brine and put on the drying shelves, should develop a fine white mould on its skin. A few years ago if the mould did not grow because the cheeses were under-acid or too firm, then they were 'floured' in a mixture of barley meal, rice flour and whiting. But no one was deceived! Worst of all, the cheese was very dusty to handle!

A good cheese to make

From a number of points of view Caerphilly is a very good cheese to make. The yield per gallon of milk is good (it can be as much as 1 lb 2½ oz per gallon, as compared with just under 1 lb of Cheddar curd from the same quantity of milk); very little fat is lost in the whey during the making process because the initial 'cut' of the curd is fairly large. The making process is comparatively short—about two hours from the time of renneting to the point where the curd is ready to pack into the moulds. If longer time than this is taken, then a tough-textured cheese results.

Finally, this cheese is ready for sale in 6–10 days after making; so turnover is quick and this is a very important consideration to the farm cheese-maker. Less storage space is needed and he will have converted the milk into a saleable product, receiving his money rather more quickly than he would do if selling the milk on the liquid market or making a hard-pressed cheese such as Cheddar.

After serving with the Agricultural Education staff of the Somerset County Council for 14 years, the author of this article, **Miss K. D. Maddever, O.B.E., N.D.D.**, joined the National Agricultural Advisory Service on its formation in 1946. Since 1951 she has been Regional Milk Production Advisory Officer for the South-West Region, stationed at Bristol.



Six to ten bales collect within the framework of this unmanned sledge. Baler speed is unrestricted

BALES

from Field to Farm

FOLLOWING the widespread adoption of quick haymaking techniques, it was inevitable that farmers would require better systems of moving bales. Naturally enough, the demand for bale handling equipment came first from farms where large quantities of hay and straw bales were being handled by teams of operators. More recently, mechanized bale handling has proved its worth on smaller farms and for one-man operation.

The number of bales carried per man-hour will depend on the yield of crop, type of equipment used, and the distance from field to stack. A reasonable target with the right equipment efficiently operated is 40–60 bales, or about 1 ton per man-hour.

Whatever system of bale handling is to be used, it is a great help to have straight, well-made bales of uniform size. This can be done by ensuring that the baler is set correctly and that the material, particularly in the case of hay,

is in good condition for baling. Three of the main items on the baler requiring special attention are the packer device, the ram knife, and the bale density adjustment. All must be set correctly to produce uniform bales.

Some farmers prefer to pick up bales singly as dropped by the baler, whilst others prefer to collect the bales and leave them in small stacks in the field to 'make' before bringing them in. To group bales coming from the baler, a bale collector is the simplest equipment. Sledges which require an operator riding on the sledge to stack the bales reduce baler output, and the labour cost for getting the bales into stacks is higher than when a man in the field builds the stacks from bales left in windrows by an unmanned sledge.

The use of manned sledges has led to a number of accidents, sometimes resulting in broken limbs, caused by the man being thrown in front of the sledge. Regulations which come into force on 1st July this year make it compulsory to fit a suitable toe board or drawbar guard to prevent this. Automatic sledges which leave the bales in stacks can be used, and they eliminate all labour for stacking bales in the field.

Bale handling equipment for one-man operation includes tractors fitted with front- and rear-mounted buckrakes or bale handlers which carry 32 bales in all. This is a good system, particularly when the transport distance is not more than about half a mile.

One-man equipment also includes single bale loading devices, such as single arm hydraulically-operated loaders mounted on the tractor, and elevators towed alongside trailers. In the case of one-man operation, the best output has been achieved by using this equipment to tumble small loads of 40–50 bales into trailers fitted with high sides. To unload at the farm, the trailer is tipped and the bales dumped near the barn, to be stacked later. This system gives a very efficient use of labour.

For maximum output on farms using a team of operators, the organization should be arranged, wherever practicable, in such a way as to avoid members of the team having to travel to and from the field with single loads of bales. One way to avoid waste of time is to take two or more tractors and trailers to the field and load them in succession before returning to the barn.

Suitably designed trailers are essential for efficient bale handling. Two-wheel trailers fitted with high sides for hauling silage are suitable for tumble loading. Where four-wheel trailers are loaded by means of a gripping type front loader with no operator on the load, some form of framework on three sides will speed up and simplify the operation.

When a transport system involves hitching trailers on and off a tractor, hydraulically-operated ring type hitches should be fitted, to avoid delays caused by winding screw jacks, etc.

If bale handling equipment is to be used for the first time this season, it will be worth while to have it fitted on the tractor well before it is needed so that the operator can practice with a few bales and check that the hydraulic equipment has been fitted correctly together with any necessary isolating valves.

W. S. SHATTOCK • R. V. FALKINGHAM

N.A.A.S. FARM MECHANIZATION, WALES

17. North-West Essex

W. C. Weston

THIS area comprises that part of Essex north and west of a line through Harlow, Felsted, Hatfield Peverel, Kelvedon, Bures and Sudbury. It totals 250,000 acres and constitutes the two advisory districts of Braintree and Dunmow.

Although without any dramatic scenery, it is nonetheless satisfying. Undulating gently between 150 and 400 feet above sea level, it enfolds some most beautiful villages. The traditional timber, lath and plaster are indicative of a county with no natural stone: but they give to the houses warmth, colour and a feeling of antiquity.

The soils throughout are dominated by the chalky boulder clay, which gives basically a clay loam over a clay subsoil, and they tend to be heavier in the north than in the south of the area. Seldom, however, is it a really unkind clay, and nowhere is it as difficult as the London Clay in the south of Essex. Sandy clay loams also occur extensively and these can be more difficult than the clay loams through instability when wet. Glacial sands and gravels are exposed mainly in the valleys of the rivers Blackwater, Colne and Stour, flowing to the south and east. Here sandy loams are most common, often with gravel near the top. In the extreme north-west, chalk appears at the surface. Elsewhere there are isolated pockets of different soils, of which the brickearths are most favoured.

The farming of the boulder clay is mostly arable. That so much of this heavy land can be ploughed is due to good drainage and adequate power to cope with it when drained. Drainage systems usually consist of tiled leads with moles drawn over; the moles will frequently stand for ten years or more in this subsoil. So much of the land *is* ploughed because of the relatively greater profitability of arable farming and an average rainfall of 22–25 inches.

Farms are generally bigger than the national average—60 per cent are over 100 acres—and they tend to get still larger. If a small farm comes on to the market nowadays, it invariably goes to a bigger neighbour.

Cereals and roots are the most important crops. The proportion of roots is, however, higher in the south than in the north, where legumes are more prominent. The growing of cereals has increased until they now commonly occupy three-quarters of the farm acreage. This expansion has occurred through a shortage of high-value change crops, and because the labour

requirements of cereals are low, they are reliable, and yields are good. Even though the gross margin on wheat exceeds that of barley, often by £10 an acre, wheat sown after wheat is not a common practice. As long as this reservation exists, little further expansion of the cereal acreage is likely. The wheat is practically all Cappelle, but in the barleys Proctor is giving ground to Pallas and Cambrinus. Oats are rarely seen.

That roots are grown so extensively on this heavy land may occasion some surprise, but a recent report* shows how important potatoes and sugar beet are to the farm economy. The potatoes are mainly King Edward, and often a particularly bright and attractive sample can be produced. The size of the crop may be restricted in future by a shortage of casual pickers, but encouraging results are being achieved on the easier soils by planting in wider rows to facilitate mechanical harvesting. Although good crops are grown, sugar beet would be more attractive if hand work in the spring could be eliminated.

Dried peas—once a major crop in the area—have virtually disappeared and viners are of only local importance, but there is a significant acreage of field beans. Although rarely valuable in themselves, they provide an entry for wheat and their risk is low. Herbage seeds are widely grown, mostly bred strains of ryegrass and cocksfoot and the local Kersey White and Essex Broad Red Clovers.

Over much of the area dairy cows are relatively unimportant—but they do figure more prominently around Braintree. The tendency is for large commercial herds with yards and parlours; but in the pedigree world within ten miles of the town are the Terling and Salwick Friesians and the Ayleward Ayrshires.

Silage is made but not extensively self-fed. Hitherto the emphasis has been on high yields from limited roughages and liberal concentrates, but the value of quality bulks is becoming more widely appreciated.

Though barley-beef production is popular throughout the area, the acreage of land devoted to grass-fed cattle is small. Sheep are only locally important and are seldom seen on entirely heavy land farms.

Pigs take no land, show a good return on labour, and provide an alternative outlet for abundant supplies of barley. They are, therefore, a natural enterprise on many farms, and frequently the accommodation and management reach a high standard. Poultry, too, are found on many farms, often as large specialist units.

The farming on the lighter soils is noticeably different. The farms are generally smaller and stock more important. Where they are large enough for extensive arable, the pattern is similar—but barley, often winter sown, increases at the expense of wheat and King Edward potatoes give way to earlier varieties or whites.

One area of light land of particular interest is renowned for its seed growing. Kelvedon Wonder is a household name for an early pea, and in the parishes of Kelvedon, Coggeshall, Witham, Cressing and the nearby Teys, flower and vegetable seeds are still produced. This same area was for many years the centre of intensively-grown picking peas, but the acreage of this chancy but colourful crop seems to decline each year.

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*Barnard, C. S. and Weston, W. C. A Design for Farming (Cambridge Farm Economics Branch Report No. 61).

H. HARLAND
Agricultural Land Service, Crewe

Taxation without Schedule A

A booklet, 'Notes on the Taxation of Income from Real Property', issued by the Inland Revenue, is obtainable free from the offices of Inspectors of Taxes

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THE Finance Act, 1963, introduced important changes in the system of taxing income derived from the ownership of property in the United Kingdom. There were two main changes. First, Schedule A income tax, or landlord's property tax as it was sometimes called, was abolished, and second, a new code for taxing rents and other income from property was introduced. For the tax year 1963–64, there were special transitional arrangements, but since 6th April this year the new system has been fully operative.

Prior to the 1963 Act, Schedule A tax was charged on the annual value of property, whether tenanted or owner-occupied. To calculate the amount on which tax was actually paid, certain deductions were allowed from the gross assessment. These included five-sixths of any tithe redemption annuity, and land tax or public drainage rates if levied as owner's rates, and a flat-rate repairs allowance. The resulting net figure was then treated as income of the person entitled to the rent or the right of rent-free occupation, as the case might be. In a case where the actual rent receivable exceeded the gross Schedule A assessment, the balance was charged to tax under Case VI of Schedule D as excess rent, subject to a repair allowance on the same scale as for Schedule A.

If, however, an owner could show that over the preceding five years his average annual maintenance costs, excluding any costs charged as an expense in the farm accounts, had exceeded the repairs allowance, then he could obtain relief from income tax on the excess. In the first place the relief was given against Schedule A and 'excess rents' income under what was known as a 'maintenance claim', but in the case of agricultural property a special provision enabled any excess not wholly relieved under a maintenance claim (because there was not enough Schedule A and 'excess rent' income against which it could be set off) to be set off against other income.

Let properties under the new system

As from 6th April this year, rents and other income from real property will be charged to tax under a new Case VIII of Schedule D. Tax will be assessed on the actual amount receivable, less allowable expenses, for the tax year (ending 5th April) for which the tax is charged and will normally be payable on 1st January in that year. However, in the first instance the assessment will be based on the previous year's income, any adjustment for over- or under-payment of tax being made when the actual receipts and expenses are known. If a landowner prefers, he can arrange with the Inspector of Taxes to use his own accounting year instead of the tax year as the basis period for computing the tax liability, provided he furnishes full accounts on a business basis, including a balance sheet, every year.

To compute the year's income on which tax is payable, certain expenses are allowed. For example, costs incurred on maintenance, repairs, insurance and management may be set off against income. But whereas in a Schedule A maintenance claim some capital expenditure was admissible, such as expenditure on replacement of farmhouses and farm buildings, on additions and improvements to farm buildings to comply with a statute, etc., under the new Case VIII capital expenditure will not be deducted. Drainage rates will be allowed as before, but five-sixths of a tithe redemption annuity can now be allowed against income from all sources. It will be possible for a landlord to set off any excess maintenance expenditure on agricultural property against income for the same year from other sources or carry it forward to be set off against income in a subsequent year.

Owner-occupied properties under the new system

Under the new system, an owner-occupier no longer pays Schedule A tax. He cannot therefore claim tax relief from this source on maintenance expenditure. However, the right of an owner-occupier of trade premises to charge maintenance as an expense in the business accounts continues. A farm ranks as trade premises for this purpose, except that part of the farmhouse (normally two-thirds) is treated as domestic, and not as trade, premises.

There are special provisions relating to owner-occupied property forming part of a larger estate of which part is let. In these circumstances the owner of the estate may elect to have maintenance expenditure on the owner-occupied part such as a mansion house included in a claim for income tax relief in respect of the whole estate. But if such an election is made the full current annual value of the owner-occupied property must be treated as a taxable receipt on the other side of the account. Other requirements are that the estate must have been managed as one estate as at 5th April, 1963, and the first option to elect must normally be exercised before 6th April, 1965. Once an election has been made it is irrevocable during the ownership of the person making it, though not binding on a succeeding owner. On the other hand, where an owner does not elect the option will not be open to a successor. Before coming to a decision on what basis to choose, it is obviously desirable to obtain expert advice.

Capital expenditure claim

The 1963 Act does not affect the capital expenditure claim, except that such claims may include new capital expenditure of the kind formerly admissible

in a maintenance claim. Under the capital expenditure claim an allowance of tax on 10 per cent of the net expenditure on improvements is given in each of the ten years following that in which it is incurred. Also, in the first year and only the first year, there is an investment allowance of 15 per cent of the net expenditure.

Transitional reliefs for expenditure

In certain circumstances owners of agricultural property can claim transitional reliefs for expenditure in the computation of their tax liability for the tax year following the last year for which they could make a maintenance claim. Information is given in the Inland Revenue booklet mentioned above.

The Ministry's Publications

Since the list published in the April, 1964, issue of *Agriculture* (p. 185) the following publications have been issued.

BULLETINS

No. 171. Diseases of Pigs (Revised) 5*s*. (by post 5*s*. 4*d*.)

Contains up-to-date information on the recognition and control of notifiable, bacterial, virus and deficiency diseases, with a new section on enteritis. Reports on research in artificial insemination, oedema disease and pneumonia are included.

No. 195. Fertilizers for the Farm (New) 5*s*. 6*d*. (by post 6*s*.)

This new Bulletin, which is divided into three parts, deals in considerable detail with plant nutrients and fertilizer materials, the general use of fertilizers, and recommendations for specified crops.

ADVISORY LEAFLETS

No. 479. The Coypu (Revised)

No. 517. Avoiding Losses in Calf Rearing (Revised)

No. 527. Yellow Rust of Wheat (New)

OTHER PUBLICATIONS

Experimental Horticulture No. 10 (New) 7*s*. (by post 7*s*. 6*d*.)

Commercial growers of fruit, flowers and vegetables will find much of interest in this edition. Articles on a wide variety of subjects include accounts of experimental work on glasshouse construction, spring cabbage varieties and spacing and covering dates for cloched strawberries.

Single copies of Advisory Leaflets, up to a maximum of six different leaflets, may be obtained free from the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be bought from Government Bookshops (addresses on p. 298), price 3d. each (by post 6d.). Other publications are obtainable from Government Bookshops, from Divisional Offices of the Ministry or through any bookseller.

IN BRIEF

New Producer Market at Cheltenham

Speaking at the opening of The Gloucestershire Marketing Society's New Market at Cheltenham last month, the Minister of Agriculture, Fisheries and Food, the Rt. Hon. Christopher Soames, C.B.E., M.P., said:

'Your Society has taken a bold step, not only because you have brought the "clock" to this country, but also because you have reaffirmed your faith in the producer market. You have invested a substantial sum in this market because you believe in the producer's ability to increase turnover and attract merchants from a wide area. I am glad that you have had some help from the Market Development Scheme and the Horticultural Marketing Council, but the vast bulk—nearly £100,000—you have raised yourselves.

'In our modern industrialized society, the structure of markets has developed differently in different countries, according to local needs. In Holland, where production is concentrated, marketing has developed on the pattern of the merchants attending auctions in the producing areas. In this country, with our large concentrations of consumers in industrial areas, we have seen most of our markets develop in those areas. That is why Government policy, as expressed in the recent Agriculture and Horticulture Act, is directed primarily to encouraging the modernization of the larger existing wholesale markets in our towns and cities.

'But that does not mean that there is no place in the national pattern for some producer markets, especially in districts where production is highly concentrated, as it is here. In districts like this, producers' marketing co-operatives have an important role. Where there is enough produce to attract buyers regularly and keep the staff and premises busy throughout most of the year, the producers' co-operative can fulfil the valuable function of local assembly point at which produce can be selected, graded, and if necessary, rejected before incurring the further cost of movement to the big cities.

'Here are all the ingredients of success, and with the vigorous spirit of enterprise and determination which you have demonstrated in great measure, surely this new market will succeed.

'Your faith in the future, based as it is on the home producer's ability to compete successfully with his overseas competitor, is matched by the Government's own faith. We have announced plans which will lead, with exchequer support, to substantial investment in horticulture over the next few years. We want to see, and I believe will see, a horticultural industry with the most up-to-date equipment and using the most modern methods of production—indeed as modern and efficient an industry as any in the world.'

Phosphate on Heavy Land

Keeping up an adequate level of phosphate in the soil is shown to be important by some crop yield figures just issued by the Boxworth Experimental Husbandry Farm.

	Adequate P	*No P*
Potatoes	7·5 tons	6·4 tons
Beans	18·8 cwt	15·7 cwt
Barley	38·9 cwt	36·7 cwt
Mangolds	28·0 tons	22·0 tons

As with similar soils elsewhere, the chalky boulder clay of this Cambridge centre carries a fairly good hidden store of phosphate. The experimental rotation of barley, mangolds, beans, and potatoes has been followed for twelve years, from which it has been found that applications of phosphate comparable to 1¼ cwt superphosphate are adequate; an application comparable to 2½ cwt superphosphate each year has given no additional response, except for the potato crop, which gave a very slight increase in yield at higher rates of application. Super is probably the best choice on this kind of soil.

From the Boxworth evidence it appears to be unnecessary to apply phosphate for a particular crop. Bulk dressings once every three years will fill the bill for this rotation just as well as annual small dressings.

Barley Beef on a Yorkshire Farm

One of the first to try out Dr. Preston's formula for barley beef was Mr. Michael Jopling, who farms 500 acres at Thirsk. That was in 1962, and he is still doing it, especially aiming at the spring period when the guaranteed price is at its peak.

Originally, Mr. Jopling bought spring-born calves for killing the following spring on a pure barley system; also autumn-born calves which were given a summer at grass, then finished on a pure barley diet in the second winter of their lives. But he has now decided to discard the latter, since the bullock can eat up to 30 lb a day of this barley ration.

There are three partly-covered fold-yards on Mr. Jopling's farm, and the idea is to fill them with cattle on an all-barley diet at a density of about 30 sq. feet per bullock. Friesian bull calves, three months old, are currently being bought in, dry-weaned and dehorned. Some come from the Welsh Border country, the rest from the north-west. They will be put straight on to the *ad lib.* all-barley diet within a week of arrival, kept in lots of not more than 40 until they are six months old, then castrated (bloodless method).

Mr. Jopling (left) and his foreman amongst some of the 150 spring-born Friesians which are fed only on barley

Built to hold 120 beasts on the barley-beef system, this steel-framed loose-housing unit is 60 ft long × 50 ft span × 10 ft to eaves

Three months before slaughter they will be implanted with 60 mg. of hexoestrol. Mr. Jopling believes that this implantation is a vital factor in achieving profitability, as the increased liveweight gain weight makes an important reduction in the total amount of feed consumed; they reach finishing weight sooner.

The cattle are bedded with fresh straw each day and satisfy their desire for roughage by consuming 2–3 lb of their bedding a day. Weighing is carried out at regular intervals. A target liveweight gain of 2·5 lb a day is aimed at and the cattle are marketed at as near 8 cwt as possible.

There have been no serious losses through disease so far. Losses are running well below 4 per cent. Virus pneumonia is undoubtedly the most serious menace, but good management and fresh air seem to be the best way of combating it.

Of the 250 acres of corn grown, 75 are in wheat and 175 in barley. This is dried to 13 per cent moisture and stored in ten Crittall bins. For food preparation, the barley is drawn from the bins and passes through a second-hand sand and gravel batch weigher, which controls the proportion of barley in the ration while maintaining a maximum amount of bulk handling of the feed.

At this stage three batches of 6 cwt each of barley are wetted and allowed to stand for a period to absorb the moisture before being rolled. The only reason the grain is wetted is to get a good quality roll without damaging the grain too much—not that Mr. Jopling believes there is any evidence that the feed value of barley is increased by wetting. He is indeed very dubious of the economics of wet grain storage.

As the grain passes through the roller, 3 cwt of a proprietary protein supplement are added and the completed mixture is conveyed out of the building into a waiting trailer, from which the feeders in the yards are filled each day.

More Sugar from Less Beet

Information from the British Sugar Corporation shows that last year's crop of home-grown sugar was 733,000 tons—that is 45,000 tons more than the previous year's. The actual tonnage of beet was over 5¼ million, so giving an average yield per acre of 12·86 tons. In 1962–63 the crop totalled 5,313,000 tons. Highest area yields (14 tons/ac.) were in Spalding, Ely and Ipswich.

The average sugar content in last year's crop was 16·67 per cent—one per cent higher than last year and similarly than the last five years' average. This reflects the much more favourable weather we had; and frost and snow were neither so severe nor so prolonged as to create transport and processing difficulties.

Books

The Cherry Situation. A. R. HUNT and R. R. W. FOLLEY. Wye College. 10s.

Here is a complex situation indeed, which this painstaking digest nobly succeeds in mastering. The limited quantities of cherries available today are so readily sold within a short distance of the south-east corner of England that they are rarely seen further north, yet production continues to fall and prices do not rise.

The authors comment that this inertness of the cherry market (which they consider can be overcome) engenders caution in recommending further planting, and any revival at all must be sustained from existing orchards for some fifteen years, whilst new plantings come into cropping.

Their extensive survey of cherries on the farm reveals the long-term nature of the crop: fifteen to twenty years to establish, and then some thirty years of cropping. The combination of high investment and long waiting should limit planting to sites where success can be assured, if such there be. Indeed, the authors say that progress in English cherry-growing depends on specialization on the fine soils of North Kent. Some may think that areas north-west of London also offer opportunities.

Of the cherry growers interviewed, only a third were still in favour of the crop, though they alone control two-thirds of the acreage, presumably the more productive. Such growers would consider replacing ageing apples with cherries, but only on the very best land. Ample evidence is provided that 'in the right situation' cherries are a profitable crop, in fact a most worthwhile investment. An average crop of 250 halves per acre (say seven per tree) from the twentieth to the fifty-fifth year could, at today's prices, average an annual net profit per acre of £165 over the tree's whole life. But if cherries do not succeed, and they often don't, then almost any other crop will show a better return.

The authors are confident that the cherry industry can be maintained and developed. They recommend minimal plantings of ten acres of dessert cherries on suitable land on large fruit farms, which can absorb the waiting period, and large-scale plantings of processing varieties on large pastoral farms where investment can be minimized and full advantage taken of mechanization.

Lest too optimistic a note be struck, the hazards should be underlined; bacterial diseases and crop-reducing viruses, dangers in replanting old ground, and bird damage. More research and more advice are needed. If this present excellent digest of the economic prospect could be followed by an equally forthright cultural survey, it might be possible to feel a little more confident of achieving the desired upsurge.

R.J.G.

Animal Health, Production and Pasture. Edited by A. N. WORDEN, K. C. SELLERS and P. D. E. TRIBE. Longmans, Green. 60s.

The rapidly increasing volume of literature published today in technical and scientific journals as original articles, abstracts, symposia, and reviews tends to be overwhelming. One result of this is that it becomes more and more difficult to produce in a single volume a well-balanced and reasonably comprehensive review of the information available on any subject or field of interest. The editors of this book have tried to provide a review of the factors which influence the health and productivity of the grazing animal—other than those concerned with infertility and genetics—and to assess available knowledge about the art and science of pasture utilization and related animal production.

The introductory chapter covers a heterogeneous collection of disorders affecting the grazing animal, and includes a brief section on ecology. This is followed by articles dealing with the management, chemistry, and nutritive values of herbage, forage crops and conserved products; the nutritional physiology of the adult ruminant; the measurement of pasture output and grazing behaviour, and on pasture management as it affects the different kinds of livestock.

A number of animal diseases are then discussed in turn, and the concluding chapter deals briefly with the use of herbicides.

The knowledge, experience, and varied interests of the editors, and the widely ranging expertise of the specialist contributors, ensure that the contents of the book are soundly based, and that its

objectives are reasonably well attained. It is well produced, well documented, and should prove of value to all who have an interest in livestock farming.

J.L.McG.

The Shell and BP Guide to Britain. Edited by GEOFFREY BOUMPHREY. Ebury Press. 30*s*.

One has only to see this book, first to wonder at the prodigious labour which has gone to the making of it—936 pages, 32 maps, 48 colour plates and a workmanlike index—and then how it could have been produced at the price, the equivalent of a mere six gallons of petrol. In these days of holidays abroad it is well to be reminded of our homeland beauty and places of historic interest a car's ride away; and to this the hundreds of photographs in the book testify excellently.

Each section carries a general introduction to the area, thence county by county, from Cornwall, through Wales to the Orkneys and Shetlands, the gazetteers pinpoint the specific attraction of each town and village. So from such a well-known tourist-laden spot as Symond's Yat where the Wye curves to encompass Huntsham Hill, we may, to make a random journey, go by way of the dramatic Pembrokeshire coast to the small ancient town of Machynlleth in Montgomeryshire, where Owen Glendower proclaimed himself Prince of Wales, across to the wide vistas and bulb fields of Lincolnshire, then north by Ripon where the Wakeman Curfew Horn is still sounded every night, to Kendal reminiscent of Shakespeare's 'Kendal Green' and the birthplace of Katherine Parr, to the wilder glories of the Western Highlands and Western Isles.

Not only the motorist will cherish this book, but since it weighs 3 lb, walkers will be well advised to do their homework before they set out.

E.D.

Suffolk Prospect. JUSTIN and EDITH BROOKE. Faber and Faber. 25*s*.

If you enjoy country books, this one by Justin and Edith Brooke should join them on your Suffolk shelf. They came as strangers to the county in 1928 and quickly got to know and love its countryside by closely identifying themselves with the village community of Wickhambrook. The employment of workers on their farms drew them into local politics and they were regarded as kindly counsellors by all. But in spite of their protests, they were clearly regarded as 'gentry' rather than 'ourselves'.

The book relates a series of anecdotes of local life now transmuted to domestic rural history. The festivity of the harvest Horkey, witchcraft, the wiles and skill of the thatcher, and the authors' keen sense of the ridiculous makes for both enlightening and entertaining reading.

For those who have come to live in or occasionally visit Suffolk and who like some background information, this book portrays the Suffolk character with singular insight and has interesting information on the dialect. It is a book about country people, and I feel also that it is a tribute to those who served the Brookes, whilst the authors leave us with the impression that they just attempted a useful life. Justin Brooke was a farmer of repute and a man before his time in mechanization. It is sad that he did not live to see his joint effort in print.

P.J.O.T.

Hammer and Tongs. Blacksmithery down the ages. GARRY HOGG. Hutchinson. 25*s*.

'Iron, cold iron, is master of them all.' But iron is the servant of the farm as well as lord of the battlefield and for many centuries the smith was an essential member of the rural community.

The factory-system dealt harshly with him, and most smithies have now been replaced by garages or agricultural machinery depots. But some survive in areas where riding-schools and hunting stables flourish, and Mr. Hogg has been able to compile his book from observation and questioning as well as from research.

He begins with a historical sketch of the blacksmith's trade, but the greater part of the book is concerned with the art and craft of the smith. He describes the forge, 'the living heart of the smithy', the tools and the technical terms of the trade. Many of the latter, such as the bosh, the scroll-dogs and the poetical names of the grades of heat, preserve the flavour of an older speech, while others, among them 'clinching it' and 'other irons in the fire' have now passed into normal language. He lists the varied work of the smith for the farmer and the country housewife and rightly devotes a lengthy chapter to the patient, exacting job of shoeing a horse.

He also tells us of the artists in iron. Some, such as Thomas of Leighton Buzzard,

who in 1294 received thirteen pounds for forging the grille that still protects the tomb of Eleanor of Castile in Westminster Abbey, are known by name as well as by achievement. But many have no memorial save the glorious gates or other ornamental work which still bear witness to their skill.

This is a pleasant practical book that gives a good, general account of the development and practice of an ancient trade which continues the traditions of the days when all things were made by hand, one at a time. It is well illustrated with photographs and drawings, but regrettably fails to give a list of further reading for those whom it will surely encourage to read further.

N.H.

Land Use in Northern Ireland. Univ. of London Press. 42*s*.

The Land Utilisation Survey of Northern Ireland began some 25 years ago, mainly as an academic exercise. This book is a summary of the findings of the Survey, which has been conducted by the staff of the Department of Geography, Queen's University, Belfast, with some help from the Departments of Agriculture and Economics.

The book is divided into four parts. Part 1 gives the historical background, briefly outlines the agricultural industry, describes the physiography, climate and soils, and finally classifies the land according to its fertility for agricultural purposes. Part 2 deals with land use, taking separately the improved lands, the rough grazing, peat bog and woodlands, and land devoted to urban and industrial use.

Part 3 discusses structural problems in agriculture, notably farm types and incomes, conacre (sometimes called the eleven-months system of renting land), and the special nature of hill farming. Finally there is a detailed regional analysis of each of the six counties of Northern Ireland.

Appendices contain statistics of the acreages of the main crops and numbers of livestock in the years 1938, 1960, 1961 and 1962, and there is also a useful bibliography and index.

Altogether about 1,000 field workers (including teachers and members of the Geographical Association of Northern Ireland) took part in the survey, and it is obvious that a great deal of effort has been necessary to make this summary possible. It is simply and clearly written. It contains much interesting information, particularly from the point of view of a geographer or sociologist.

But to most agriculturists its use would appear to be rather limited because it falls between two stools. On the one hand it contains detail that does not help with agricultural problems and is unnecessary for the assessment of national potential agricultural production. On the other hand, for detailed planning on a field-by-field basis, such as was necessary during the war, there is not enough detail, and in any case, the accuracy of the land classification would be called in question by agriculturists.

J.A.Y.

The Water Relations of Plants. RUTTER and WHITEHEAD. Blackwell Scientific Publications. 67*s*. 6*d*.

Few living things can survive for any length of time without water, and as the water requirements of a rapidly increasing and urbanizing world population rise, greater knowledge is needed to utilize the available supplies to the best advantage. The third symposium of the British Ecological Society was concerned with background studies on the water relations of plants, and presented current theories and ideas on many aspects of this subject.

These published proceedings of the symposium contain twenty-seven scientific papers grouped under four general headings: water in the environment, physiological studies of water in plants, water relations in natural conditions and the relation of plant growth and distribution to water. A wide range of topics, with the emphasis upon ecology, is covered within the groups, from the more obviously practical, such as 'Cropping Pattern and Water Relations' and 'Growth and Water Use of Vegetables in a Greenhouse', to a consideration of how useful the concept of potential water deficit can be to ecologists as a climatic discriminant and 'Dew: Facts and Fallacies'. The papers vary greatly in scope and purpose.

This is primarily a book for the specialist in plant ecology. The papers are generally very technical and many contain data that cannot be fully appreciated except by those with specialist knowledge. However, there is interesting and useful information of a more general nature for the less academic reader, and foresters in particular will appreciate the concise account of 'Water Relations in Forest Trees' by E. E. Gaertner.

A study of the vegetation of arid areas is always one of the most obvious aspects of plant/water relations. It seems surprising, therefore, that a book having this

title contains only a few papers on the subject. But as the editors point out, the problems of arid lands were more fully considered by a previous symposium, and as this one was mainly concerned with temperate vegetation, the two are largely complementary.

The volume is excellently produced and contains a large number of clear figures and graphs.

R.J.C.

A Survey of the Agriculture of Cheshire. W. B. MERCER. Murray. 25*s*.

In this book we have a comprehensive and detailed account of the county of Cheshire, as related to agriculture and agricultural education. It is the fourth of a series of country agricultural surveys produced by the R.A.S.E. and much trouble has been taken to obtain accurate information from many sources. This is evident from the author's preface. And who could be better qualified to make and to write such a survey than the late W. B. Mercer, who spent the greater part of his life in the county and who was a pioneer and a leading figure in the development of agriculture and agricultural education?

The survey begins with a description of the topography, soils and drainage, showing clearly the stages, spanning aeons of time, by which the pleasant landscape of the county was formed.

Following this, is an historical account of man's efforts to turn nature's provision to his own advantage by developments which have resulted in present-day farming. Then there is an extensive and detailed review of Cheshire farming based on farming in the middle 'fifties' and therefore already partly out of date; but this is inevitable in any survey.

The remainder of the text deals with the farming, region by region. While the dairy cow is the main source of livelihood everywhere in Cheshire, variations do occur because of the nature of the soil, its height above sea level, urban development and other factors.

Appendices include, amongst other things, acreages of crops and numbers of livestock for the years 1939, 1944 and 1956, and the final section of the book is composed of a series of charts and maps giving further details of cattle numbers and crop acreages, as far back as 1870.

Altogether, the book is a truly admirable survey of the agriculture of Cheshire, and one which will no doubt become a standard work of reference. It is also written in fine literary style, which makes for pleasant and interesting reading.

J.K.L.

Landscape and Soil. A. VOYSEY. Longmans, Green. 6*s*.

About one-third of this book, which is published in the Rural Education series, deals with the landscape and two-thirds with the soil, and the relationship between them, regrettably often omitted in such studies, is particularly well brought out here. The work follows a carefully arranged progression, from the introduction in Chapter 1, to the section where the young reader is shown how to examine the land and to understand the significance of what he notices. Eight different types of landscapes are shown, with excellent drawings and explanations.

The larger section, on the soil, is most attractively presented. It provides sound and simple explanations which occur quite naturally as the pupil reads. The applications of scientific statements and principles are always stressed, and the reader is invariably shown how the farmer puts them into practice. Sometimes the farmer's work is explained first and followed by the scientific reasons, sometimes the reverse, but nothing is left unexplained.

Experimental work is introduced incidentally, so that pupils will undertake the experiments suggested because they want to prove things for themselves. The final chapter, 'Observation and Demonstration', is extremely useful, detailing a series of easy experiments and suggesting interesting ways of finding out about the soil in all its aspects.

Other features are a list of books for further reading together with a brief appraisal of each, and a very full and most helpful index. With such an index available the frequent references in the text to other parts of the book—there are five on page 4, for example—are hardly necessary. Children tend to be irritated by anything which impedes continuity when they are absorbed in reading, as they undoubtedly will be here.

This most workmanlike and worthwhile book contains extremely sound material, intelligently phrased in language which is reasonably simple for boys and girls to understand. It has a strong appeal yet in no way talks down to them.

A.S.

A Bibliography of Farm Buildings Research. Part IV—Buildings for Cattle. 1st Supplement, 1958-61. Agricultural Research Council. 6*s*.

The profit motive has inspired man to do many things. None has brought more problems in its train than the intensive housing of livestock. First pigs, then poultry, and now cattle are being intensively housed.

These sudden changes in husbandry methods are introduced without much thought for the consequences. The new system is superimposed on the old. Buildings admirably suited to earlier systems are pressed into service for the new. For a time all goes well and then, with alarming suddenness, nothing goes right.

When this happens we are apt to distribute blame in all directions, and in the end to ask why isn't some research being carried out into the kind of trouble which has arisen.

All too often our ignorance of what is being done, or has been done, convinces us that nothing is known. Inexcusable, perhaps, but understandable to a large extent, for few have time to discover all that is happening.

This supplement, which is just as valuable to the farmer as to the research worker or agricultural adviser, overcomes such lack of knowledge, and presents clearly and concisely a summary of research work up to 1961. Far more has been done than most people realize.

C.R.

The Rhododendron and Camellia Year Book, 1964. Edited by P. M. Synge and J. W. O. Platt. Royal Horticultural Society. 15*s*.

This excellent publication contains many interesting features. The merits of south-west Scotland as a situation for both rhododendrons and camellias are clearly illustrated by the articles, Giant Rhododendrons of the West, by Ilay Campbell, the Natural Regeneration of Rhododendrons at Benmore, by R. L. Shaw, and Growing Camellias off the West Coast of Scotland, by Sir James Horlick. In each case, the vivid descriptions will bring the picture to life before a reader who has no knowledge of what is possible with trees and shrubs in that favoured area.

Contributions from the South include Rhododendrons and Azaleas at Coles, by Patrick Synge, which shows what can be done on a far from favourable site. The grouping of rhododendrons in small and medium-sized gardens, by David Wright, has evidently been given much thought, while a brief note by E. H. M. Cox draws attention to rhododendrons which have scented foliage as an additional attraction.

How to propagate camellias by cuttings and by grafting is clearly described and illustrated by P. Wiseman. In his discussion on the behaviour of the *Kunming Reticulata* camellias at Windsor, T. M. Findlay finishes on the rather sad note that few gardens in Britain will grow them successfully in the open; nor do they make good pot plants. On the other hand, the hardiness of many camellias is proved beyond all doubt by Reginald Try, who writes of his experiences at St. Leonards Hall, Windsor, where trees of up to 100 years of age are flourishing in situations exposed to all aspects. The need for light pruning—when plants are in flower—is stressed, and for major operations on the really big trees to reduce the risk of damage by weight of snow.

The development of a Rhododendron Park at Pukeiti, New Zealand, makes interesting reading.

There are reports on shows, competitions, reviews and frost damage, and the text and illustrations are beautifully clear. Anyone interested in either rhododendrons or camellias should not fail to have this book.

A.D.H.

Red Dragon Farm. A. M. Morrison. Faber and Faber. 30*s*.

Anyone whose interest in the story of Red Dragon Farm was kindled by the recent film in the B.B.C. television programme *Farming* will enjoy reading this detailed account of the project. As recounted by its well-informed author, who is a farm manager and a veterinary surgeon, the story is—in spite of the modest disclaimer in the Introduction—something of a textbook in applied animal ecology. It is therefore desirable to go a little beyond praise of the plan and sequence of the book, of the fascinating pieces of personal philosophy, of the racy and pleasant style of writing and of the interesting illustrations.

Fundamentally, it seems to me that there is an area of special pleading for Welsh Black cattle as potential saviours of cattle production under Highland marginal conditions, when so much of the success obtained clearly stems from (*a*) the 'two-thirds' which rests on 'feeding and environment', and which all visitors to Cymru Fach testify is so amply provided there, and (*b*) the origin of the animals in 15 'hand-picked females' which are 'deep-milkers, some

indeed in the thousand-gallon class, with massive frames and well-developed hindquarters'. One is left with the feeling that, as usual, superlative management is, broadly speaking, more vital than breed, and that Red Dragon Farm has not shown otherwise. That the breed has been supremely successful is in no doubt from the well-documented information given in this book.

It is unnecessary to gild the lily by ascribing to the breed miracles of hardness and thriftness that really arise from conditions which, by reason of good farming, are not unusually challenging. (In fairness, there is some reference to earlier good results obtained under rigorous conditions in Sutherland; but this evidence is not developed.)

With the gradual liberalization of ideas on the relationship of environment to heritable characters, it is hard to see that being 'reared for decades on a nutritional level which can only be called spartan' will stand any breed in good stead.

Early in the book Mr. Morrison poses the conundrum why the Highland small farmer often uses tinned milk while the Welsh smallholder can drink milk, sell milk and rear more calves. This is a good question, and one not adequately answered by the suggestion that the latter has Welsh Black cattle! It may be that much human ecology is involved and that the author has just the right mixture of philosophy and acute observation to try to answer it more fully; perhaps one day, he will return to the subject!

D.S.H.

The Growth of the Potato. Proceedings of the Tenth Easter School in Agricultural Science, University of Nottingham, 1963. Edited by J. D. IVINS and F. L. MILTHORPE. Butterworth. 70*s*.

At the latest University of Nottingham Easter School, the topic chosen was a single crop, the potato, and in this volume our knowledge of its physiology and biochemistry, and response to various environmental factors comes under close scrutiny, as does the way in which this knowledge can be used by the grower and the processor. Contributors came from France, Germany, Great Britain, the Netherlands and Sweden, and their interests ranged from biochemistry to plant breeding and agronomy.

The twenty-three papers are arranged into sections, and in the first four the life of the potato plant is examined, starting with the dormant tuber, proceeding through sprout growth to stolon growth and tuber initiation and finally to tuber metabolism. This is followed by two sections dealing with environmental aspects of growth and mineral nutrition, and the concluding section is on agronomic aspects. In addition to the papers, each section gives a brief account of the discussion which the papers engendered. As with previous books in this series, the production is of high standard; each paper has a list of references, and there are comprehensive subject and author indexes.

In such a work as this, the appeal of each paper varies, for although each has the potato as the central theme, some authors range widely in the material they present. In the section on tuber metabolism the approach is very specialized; fundamental research and applied problems come near to each other, particularly in the consideration of the biochemical aspects of quality of potatoes. In other sections, for instance on mineral nutrition, general principles and methods are outlined which have much wider application than the title of the book suggests.

This book provides a source of up-to-date information and references, not only on particular aspects of potato growth and culture, but also on the biological principles and methods which have been brought to bear on such problems. As such it will be of interest to plant physiologists and agronomists, as well as potato growers and processors.

E.J.M.K.

BOOKS RECEIVED

Meteorological Glossary. D. H. McIntosh. H.M. Stationery Office. 32*s*. 6*d*.

Annual Report of the Plant Breeding Institute, Cambridge, 1962–63. 5*s*. 6*d*.

The Jubilee Annual Report, 1963; East Malling Research Station, Maidstone, Kent. 17*s*. 6*d*.

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Agricultural Chemicals Approval Scheme

Advance Notice of Changes in 1965 List

Footnotes against aldrin, dieldrin, BHC and DDT in the 1964 List stated that certain recommended uses of these chemicals might be restricted or proscribed. No restrictions will take effect this year, but following upon the Government's acceptance of the report of the Advisory Committee on Poisonous Substances used in Agriculture and Food Storage on persistent organochlorine pesticides, certain changes will be made in the 1965 List.

Aldrin and dieldrin. The approved uses of these chemicals will be restricted in 1965 to the following only:

(*a*) **Aldrin and dieldrin seed dressings**: on winter sown wheat (up to the end of December), against wheat bulb fly where there is a real danger of attack by this pest; and on rubbed and graded sugar beet seed for precision drilling.

(*b*) **Aldrin and dieldrin insecticides**: against wireworm in potatoes, cabbage root fly and narcissus bulb fly on commercial holdings.

(*c*) **Certain minor uses of aldrin and dieldrin** as insecticides and seed dressings, which are still under review and subject to agreement by the Advisory Committee and Departments, will also be included in the 1965 List.

DDT and BHC. No changes will be made to the uses of DDT and BHC, although DDT will be further reviewed in 3 years' time. The footnotes under DDT and BHC in the 1964 List are therefore cancelled.

Use of persistent pesticides. Users are urged to be economical in their use of all persistent organochlorine pesticides and to use less persistent chemicals whenever possible.

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